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TERRIER (C. A.). **Un nouveau champignon parasite des aiguilles du Sapin blanc : Dimeriella terrieri Petrak nov. spec. in litt.** [A new fungus parasitic on the needles of the White Fir: *Dimeriella terrieri* Petrak n.sp. *in litt.*]—*Ber. schweiz. bot. Ges.*, lvii, pp. 164–173, 8 figs., 1947.

In May, 1938, the writer noticed the presence of *Phaeocryptopus gaeumanni* on Douglas fir [*Pseudotsuga taxifolia*] near Porrentruy, Bernese Jura [*R.A.M.*, xviii, p. 590], and in 1941 he returned to the locality for further investigations. While examining other conifers for a possible extension of the host range of *Phaeocryptopus gaeumanni*, the lower surfaces of the needles of a young *Abies alba* were observed bearing very similar fructifications. However, instead of being aligned along the stomatal rows, as in the case of *P. gaeumanni*, they were more or less densely grouped at random on a superficial reddish mycelium, which formed one or more irregular, discrete or confluent patches, mostly covering a large part of the needle. The affected needles sustained no apparent damage, remaining green or showing at the most a mere trace of discoloration at the sites occupied by the patches of mycelium.

Further observations were made in 1942, 1945, and 1946, when the question of identification arose. A specimen was addressed to Dr. F. Petrak for his opinion, and in the meantime the fungus was provisionally determined by the author as *Dimerosporium abietis* [ibid., v, p. 126]. Dr. Petrak, however, considered that *D. abietis*, *D. tsugae*, *Meliola balsamicola*, and the Swiss parasite should all be referred to *Dimeriella*, the last-named as *D. terrieri* n.sp., and his Latin diagnosis and German description are given. The spherical perithecia measure 70 to 100, rarely up to 120 μ in diameter, the setae 15 to 40, rarely up to 50 by 4 to 5 μ, the obclavate, subsessile, or very shortly pedicellate asci 30 to 40, rarely up to 45 by 10 to 12 μ at the base, and the hyaline, oblong-clavate to fusiform, straight or occasionally slightly curved, uniseptate, uni- or pluriguttulate, bi- or triseriate ascospores 10 to 16 by 3·5 to 5 μ. *P. nudus* [ibid., xvii, p. 638], which is sometimes found in association with *D. terrieri*, is readily distinguishable by the minute white dots (wax plugs) at the perithecial apices. Moreover, the perithecia of the former are entirely glabrous and the cells of the membrane much paler than the almost opaque, blackish-brown ones of the latter, while the ascospores of *P. nudus* are smaller than those of *D. terrieri* and light olive-brown.

Mass infection by *D. terrieri* probably occurs in the autumn, the needles being penetrated through the stomata. Neither the hyaline intramatrical, nor the fuliginous extramatrical hyphae form appressoria or haustoria, and the external hyphal network is readily detachable from its support. The fungus completes its life-cycle on the living needles, and the development of the ascogenous fructifications does not appear to be preceded by an imperfect state. A high degree of atmospheric humidity in the microclimate seems to be requisite for the growth of *D. terrieri*, judging by its habitat along roadsides on the lower branches of young firs arising from natural sowings and forming clumps surrounded by tall grasses.

Lagerberg (T.). **Coniophora fusispora, en rotsvamp i Norrländsk Tall.** [*Coniophora fusispora*, a rot fungus in Norrland Pines.]—*Norrlands SkogvFörb. Tidskr., 1944*, 2, pp. 123–134, 4 figs., 1944. [English summary. Received September, 1948.]

Living conifers are subject to various kinds of butt rots. As defined by the author, true butt rots seldom extend above breast height and are caused by soil fungi which have entered the trunk through dead roots. These rots include some of the so-called 'cubical' type associated with *Coniophora fusispora*, observed on pines in Swedish Lapland in 1935 [*R.A.M.*, xiv, p. 803], *C. puteana*, *C. bourdotii* [ibid., xvii, p. 715], and possibly *C. olivacea*.

In pure cultures on malt agar the colour of the mycelium of *C. fusispora* changed in the course of a few weeks from pure white to deep yellow, and later snuff-brown, and during the period of rapid growth it exhaled a strong scent of flowering acacias. Fruit bodies, on which the identification of the species was based, developed in a five-month-old culture. The basidiospores measured 15 to 19·7 by 5·6 to 7·5 μ.

Björkman (E.). **On the development of decay in building timber injured by blue stain.**—*Svensk PappTidn.*, 1, 11B, pp. 49–52, 5 figs., 1947.

Some important contributions to the literature on decay in structural timber are briefly reviewed and an account is given of the author's experimental studies at the College of Forestry, Stockholm, in 1944–5 to determine the relation of blue stain to the subsequent development of the rotting fungi [*R.A.M.*, xxvii, p. 322]. In one test 495 blocks of Scots pine sapwood were inoculated with conidial suspensions of *Ophiostoma* [*Ceratostomella*] *piceae* and *Pullularia pullulans*, maintained under optimum conditions for the growth of the organisms for 14 or 28 days, dried at 105° C., and sterilized. They were then transferred to Erlenmeyer flasks containing three-week-old pure cultures of the most destructive house fungi, *Merulius lacrymans*, *Coniophora puteana*, *Poria vaporaria*, and *Paxillus panuoides*, while another series comprised the common agents of storage decay, *Stereum sanguinolentum*, *Trametes serialis*, *T.* [*Lenzites*] *trabea*, *Polyporus* [*Polystictus*] *abietinus*, *Polyporus ferrugineo-fuscus*, *L. sepiaria*, and *Lentinus lepideus*. The tabulated results of the experiment reveal little difference between the incidence of infection in the blue-stained blocks and the unstained controls. *M. lacrymans* produced 11·4 per cent. decay in the unstained blocks, 11·2 and 13·2 per cent., respectively, in those exposed to attack by *Ceratostomella piceae* for 14 and 28 days, and 11·8 and 12·1 per cent., respectively, in those infected by *Pullularia pullulans* for the two periods. The corresponding figures for *Coniophora puteana* were: controls 51·7 per cent., *Ceratostomella piceae* 14 and 28 days, 57·2 and 52·2, and *P. pullulans* 14 and 28 days, 51·8 and 49·8; for *Poria vaporaria* 42·8, 37·1, 38·2, 40, and 37·2; and for *Paxillus panuoides* 17·1, 16·7, 17, 17·3, and 18; for *S. sanguinolentum* 16·5, 16, 17·2, 16·2, and 17·8; for *T. serialis* 61·5, 60·8, 60·4, 58·2, and 56·2; for *Lenzites trabea*, 40·8, 37·1, 41, 39·2, and 38·5; for *Polystictus abietinus* 10·2, 9·7, 8·2, 10·3, and 11·3; for *Polyporus ferrugineo-fuscus* 49·7, 54, 55·7, 52·2, and 50·6; for *L. sepiaria* 19·7, 25·2, 20, 21, and 21·8; and for *Lentinus lepideus* 37·8, 38·2, 41·5, 41·6, and 40·8, respectively.

In another test, using the practically ubiquitous *Trichoderma lignorum* [*T. viride*] as the source of blue stain, decay by *M. lacrymans*, *Coniophora puteana*, *Poria vaporaria*, and *Paxillus panuoides* was about equally advanced after two months in the stained and unstained blocks. In a final experiment the inoculum consisted of *Ceratostomella piceae* in the living state, and in this case the extent of rotting by *M. lacrymans* and *Coniophora puteana* was rather less in the stained blocks than in the controls.

It would appear, therefore, that active blue stain infection confers a degree of protection against the rotting fungi, and that in any case it does not predispose

the wood to their attacks. The question of the real significance of blue stain has aroused lively discussion in Sweden of late years in connexion with the revision of the grading rules for sawn-wood goods, and it has also gained increasing importance for the international trade. The depreciation regulations in respect of blue stain are now generally held to be much too drastic, and it may be assumed that dry timber (moisture content below 20 per cent.) is unlikely to suffer damage from the wood-rotting fungi as a sequel to the blemish.

GRAEBER (H. W.). **Treating transmission poles in line service by spraying with a 5 per cent. pentachlorophenol petroleum solution.**—*Proc. Amer. Wood Pres. Ass.*, xlii, pp. 279–281, 4 figs., 1946.

The spraying of hand-shaved sapwood decay spots in the upper parts of standing butt-treated transmission poles by means of a hand-operated sprayer was practised as early as 1930, but by 1939 it had become evident that full-length treatment was advisable. Tests [? in Minnesota] showed that a 5 per cent. pentachlorophenol-petroleum solution gave the best penetration and retention. An economical spraying device was then constructed, consisting of a spray drum built in two halves and hinged, to allow opening and closing round the pole. Inside were compensating rollers to allow sliding down the pole and for adjustment to increased diameter, together with spray nozzles connected by a pressure supply hose to a small compressor. By 1943, over 1,000 large poles had been treated. In 1945, inspection showed that all decay spots were dead and that the preservative had penetrated the full depth of the sapwood. Untreated poles showed active decay. It is reasonably certain that the upper part of the treated poles, with the large retention of pentachlorophenol, is decay-proof. A crew of five men treated 30 to 35 poles, 55 to 60 ft. long, per eight-hour day.

WALTERS (C. S.). **Preservative treatment of White Pine fence posts at low temperatures.**—*J. For.*, xlvi, 3, pp. 180–183, 1948.

At the Illinois Agricultural Experiment Station 50 round, eastern white pine [*Pinus strobus*] posts were dried, peeled, and cold-soaked 144 hours in a 5 per cent. solution of pentachlorophenol [*R.A.M.*, xxvii, p. 343] in light fuel oil. Temperatures recorded during the immersion period ranged from 18° to 22° F. for the air and 14° to 26° for the treating solution. At the end of 48 hours penetration of the sapwood was for all practical purposes complete, the amount of preservative absorbed being 2·9 lb. per cu. ft.; after 144 hours it rose to 3·7. Analysis for pentachlorophenol at various depths in the treated posts showed that the penetration of the preservative coincided with that of the petroleum solvent carrier. Hence it was possible to determine the depth of penetration of the fungicide from increment borings by the colour imparted by the oil solvent.

WATKINS (S. S.). **Wood preservation for mines.**—*Min. Congr. J., Wash.*, xxxiv, 4, pp. 75–77, 5 figs., 1948.

Creosote, with or without coal tar or petroleum, is the most commonly used preservative for wood products in United States mines, but in cases where the need for a high degree of fire resistance partly or wholly excludes an oil treatment, one of the recognized salts may be substituted. Air seasoning is the usual method of pre-conditioning the wood by the removal of sufficient water to enable impregnation with the required amount of preservative to penetrations consistent with the retentions specified. However, where time does not permit of proper air seasoning, the wood should be heated in oil under a vacuum (the Boulton process) [*R.A.M.*, xiii, p. 202] or steam-conditioned, according to the species used and the subsequent treatment to be given. Other methods are now being developed to simplify and

expedite the process of conditioning, notable among which is the vapour-drying method.

Not many years ago the annual consumption of cross ties in the United States alone ranged from 130,000,000 to 150,000,000 pieces, whereas to-day it has been reduced by wood preservation to 40,000,000. At the same time, treatment has made possible the use of a wide range of wood species which were formerly useless for the purpose in view owing to low natural resistance. The average duration of life of ties in track, moreover, has been multiplied three or four times, and they should now last 15 to 30 years, depending on the value of the service required of them, while the life of other ties, not subjected to severe mechanical wear, may be almost indefinitely extended. Some figures are cited showing that treated timber need last only 11 years to make its use economical as compared with untreated material with a six-year service life.

Pentachlorophenol-treating plants for farm communities.—*Down to Earth*, iv, 2, pp. 8–10, 4 figs., 1948.

A description is given of two types of plant suitable for preserving wooden fence posts with pentachlorophenol [see above, p. 99], one for the hot-cold wood transfer process, and the other a hot-cold oil transfer plant. The posts must be barked prior to treatment and various machines for this purpose are also described.

Gottschalk (F. W.). **Wood preservation in Europe.**—*Proc. Amer. Wood Pres. Ass.*, xlii, pp. 70–72, 1 fig., 1946.

During a visit to Germany in 1945, the author ascertained that the 35 major wood-preserving plants, treating mainly railway sleepers, produced about 36,000,000 cu. ft. of timber annually [cf. *R.A.M.*, xxvi, p. 139; xxvii, p. 303]. The timber was air-seasoned only by the 1 by 8 or 1 by 9 piling method and generally stacked in the open. A typical wood-preserving plant had two or three retorts about 6 ft. in diameter and 60 ft. long. No new impregnation methods had been developed, but a number of retorts made since 1938 had fast-closing doors (breech-lock type). By 1940 most of the treatment was done by 'flumax' (84 per cent. sodium fluoride and 16 per cent. caustic xylenol), Wolman salts, basilit, or zinc chloride [ibid., xxv, p. 324]. Carbolineum Avenarius was made in a substitute form from brown coal tar. A unique coal tar distillation plant, built in 1943 in the Ruhr, was observed; this operated at a monthly capacity of 8,000 tons, using a continuous system with a maximum tar temperature of 320° C.

Blew (J. O.). **Comparison of preservatives in Mississippi fence-post study after 10 years of service.**—*Proc. Amer. Wood Pres. Ass.*, xliii, pp. 26–41, 1947.

The author reports the results of a service test near Saucier, Mississippi, begun in 1936 on southern yellow pine [*Pinus palustris*] fence posts treated with 26 different preservatives [*R.A.M.*, xxi, p. 109; xxvi, p. 139], and he describes their condition in 1946.

The average life of untreated posts was 3·3 years, of those installed in dry soil 2·6 years, those in soil wet throughout most of the year 4 years, and those in swamps or standing water 4·8 years. Failure of those in the first and second categories was due to combined decay [unspecified] and termite attack, but in the third category it was due mostly to decay.

The posts treated with coal tar creosote, the same plus crank-case oil (50–50), pentachlorophenol (4·82 per cent. in crank-case oil), tetrachlorophenol (2·9 and 4·83 per cent. in crank-case oil), water gas tar, and zinc meta-arsenite, showed no failures after 10 years' service, while those treated with copper sulphate–sodium arsenate (set in 1941) showed none after 5½ years.

Other preservatives which provided resistance to decay (but not necessarily to termite attack) were coal tar, osmosar, P.D.A. (0·84 per cent. phenyldichlorarsine in gas oil), pentachlorophenol (3·02 and 4·82 per cent. in crank-case oil), Wolman salts, zinc chloride, and osmoplastic ground-line treatment (the last set in 1941), posts having less than 4 per cent. decay.

COLLEY (R. H.). **Non-pressure hot and cold-bath treatments of Lodgepole Pine poles with creosote, and with pentachlorophenol petroleum creosote solution.**—*Proc. Amer. Wood Pres. Ass.*, xlii, pp. 282–296, 1 fig., 1 graph, 1946.

In this progress report the results obtained in 1944 and 1945 at the Valentine Clark Corporation Plant, St. Paul, Minnesota, from non-pressure submersion treatments on a commercial scale [*R.A.M.*, xxvi, p. 88] of machine-shaved, air-seasoned, lodgepole pine [*Pinus contorta* var. *latifolia*] poles are described. The poles were incised at the ground line, gained and bored, and treated full length by (1) hot creosote for 8 to 8½ hours at 210° to 235° F., then cold creosote for 3 to 5½ hours at 125° to 150°, and finally hot creosote for 2 hours at 210° to 220°; or (2) hot creosote for 4 to 4·7 hours at 210° to 235° then cold pentachlorophenol-petroleum-creosote (80 to 85—15 to 20—4·3) solution for 4 hours at 110° to 130°.

The data obtained showed that deeper penetration and a higher percentage of sapwood penetration were obtained by method (2) in little more than half the time required by method (1). Further, the results were much more uniform with method (2); in other words, there was better correlation between depth of sapwood penetrated and the average depth of penetration in individual borings, that is, in the individual poles. The average retention of pentachlorophenol assessed three weeks later for ten poles was as follows: incised butt section, outer ½ in. 0·55 lb. per cu. ft., next ½ in. 0·53 lb. per cu. ft., inner ½ in. 0·24 lb. per cu. ft., and in the non-incised mid-section, 0·49, 0·43, and 0·19 lb. per cu. ft., respectively. The depth of sapwood averaged 1·04 in. in smaller poles and 1·18 in. in larger poles. The total retention of pentachlorophenol was about 6 lb. per cu. ft. and of creosote from the mixture 1 to 1½ lb. per cu. ft. Thus the ground-line sections appear to be more than adequately protected and retention of pentachlorophenol in the non-incised above-ground sections was surprisingly good. In most cases it appears that all of the sapwood is protected against fungal attack because of the creeping of the petroleum creosote and the migration of the pentachlorophenol itself.

The use of the final two-hour hot bath in method (1) was necessary to improve penetration, remove excess creosote, and reduce 'bleeding'. The one drawback was that the poles were too hot and time had to be allowed for cooling before the poles could be removed. This difficulty was completely eliminated by method (2). The machine-shaved, air-seasoned poles treated by method (2) have turned out to be non-bleeding as far as can be determined.

RICHARDS (C. AUDREY) & ADDOMS (RUTH M.). **Laboratory methods for evaluating wood preservatives : preliminary comparison of agar and soil culture techniques using impregnated wood blocks.**—*Proc. Amer. Wood Pres. Ass.*, xliii, pp. 41–58, 4 figs., 1947.

A comparison of a modified form of the German wood-block method of evaluating the toxicity of wood preservatives to fungi [*R.A.M.*, xviii, p. 829; xxv, p. 376], used by the American Division of Plant Pathology and referred to in the present paper as the 'agar method' with the Leutritz wood-soil contact culture technique [ibid., xix, p. 127; xxv, p. 588], indicated that both methods gave reliable results when used to screen out worthless preservatives and to determine roughly the approximate retentions at which the materials tested might be expected to be effective if several fungi were used in the tests.

Creosote and pentachlorophenol (in diesel oil) at all tested retentions were effective against *Lenzites trabea*, *Poria incrassata*, *P. microspora*, *P. luteofibrata*, and *Trametes serialis*, though the lowest treating retentions tested, 2 and 0·125 lb. per cu. ft., respectively, did not prevent attack by *Lentinus lepideus*. Copper naphthenate controlled all six fungi down to 0·25 lb. of copper per cu. ft., but not at 0·07 lb.

Greensalt K [ibid., xxiii, p. 247] did not prevent decay in the Leutritz series by *Lenzites trabea*, *P. incrassata*, and *P. luteofibrata* at retentions up to one lb. per cu. ft. None of the treated blocks, even at the lowest retention (0·25 lb. per cu. ft.), was attacked by *Lentinus lepideus*. *P. incrassata* and *P. microspora* caused more decay with the agar method, while *Lenzites trabea* and *P. luteofibrata* caused much less, than with the Leutritz.

All the blocks treated with 0·25 lb. zinc chloride per cu. ft. in the Leutritz series decayed. At one lb. per cu. ft. *P. incrassata*, *P. luteofibrata*, and *T. serialis* attacked them, while *Lenzites trabea*, *Lentinus lepideus*, and *P. microspora* did not. In the agar series there was no obvious decay in any blocks treated with zinc chloride except at the 0·25 lb. per cu. ft. rate and inoculated with *P. microspora* and *P. luteofibrata*.

Under the experimental conditions the Leutritz method was somewhat the better of the two but both require further study and improvement. It is suggested that in future the fungus cultures should be designated by a collection number as well as by name. The product to be protected should be taken into consideration when test organisms are selected, and several different organisms should be used because of their different degrees of tolerance of chemicals [ibid., xxv, p. 376]. If test blocks are cut accurately, even minor amounts of decay can be detected by the distortion of the dried blocks after removal from test. For commercial purposes, visual examination may supply sufficient information on the relative protection afforded by the preservatives tested.

Hickson (H. E.), Jofeh (A. J.), & Bulman (R. A.). **Notes on wood preservation, by pressure methods, in Great Britain, New Zealand, Australia, and South Africa, against a background of standardization.**—*Proc. Amer. Wood Pres. Ass.*, xliii, pp. 265–278, 3 figs., 1947.

The authors describe the present stage of development of wood preservation by pressure methods in Great Britain [*R.A.M.*, xxvii, p. 52], New Zealand [ibid., xxv, p. 378], Australia [ibid., xxv, p. 195], and South Africa [ibid., xxvi, p. 88; xxvii, p. 51], the picture having as a background the process of standardization and the manner in which the various organizations are dealing with the problem.

Brief details are given of the current practice, plant design, local hazards, timber species, forms of timber treated, and the application of creosote by pressure. In Great Britain, with the continued use of creosote for the protection of exterior timbers the modern trend is towards the use of preservation for internal timbers. In South Africa, wood preservation is being called upon to meet an insect invasion. In Australia and New Zealand wood preservation is bringing into commercial use indigenous timbers not previously employed. This increasing application of wood preservation to interior timbers, in conjunction with the present shortage of creosote, is directing attention to other preservatives. Water-solubles are at present rapidly consolidating their position in the pressure-treatment section of the timber preservation industry.

Bescher (R. H.) & Kepfer (R. J.). **Accelerated service tests of wood preservatives.**—*Proc. Amer. Wood Pres. Ass.*, xlii, pp. 57–69, 2 figs., 1 graph, 1946.

Further results are given of the outdoor tests in different parts of the United States for wood preservatives devised by the Bell Telephone Laboratories [*R.A.M.*,

xvi, p. 79; xviii, p. 830; xxiii, p. 246]. So far, 307 different groups of southern yellow pine [*Pinus palustris*] specimens totalling 9,609 pieces have been installed in seven test plots. Generally, the greatest decay occurred at or near the ground line, change of ground line increasing the life of the specimen.

All the specimens in the two principal plots have been inspected at six-months' intervals after the first year of exposure, and the specimens in the others at intervals of about one year. Specimens were classified at each inspection as, I (sound, no evidence of decay); II (soft on the surface or showing other indication of decay); III (partial shallow decay); IV (partial deep decay); and V (severe decay, entailing almost total loss of strength). To secure a relative estimate of the average condition of a group of specimens, values of 100, 75, 50, 25, and 0 were assigned to the respective grades I to V. The average of these values for all specimens in a group is designated the Index of Condition for that group, and is used for determining the relative degree of preservation of various groups of specimens at any given time. For example, an Index of Condition of 75 for any particular group indicates that it is beginning to show signs of decay.

Calculations based on some 600 specimens from 37 groups all members of which had reached condition V showed that in general a group has attained its average length of life when 60 per cent. of its members have reached condition V.

Tables are given showing the effect of different preservatives on and the average service life of round and squared southern yellow pine saplings and various woods in comparison with yellow pine. The average life of the untreated round saplings ranged from 16 to 20 months, for those treated with zinc chloride 33 to 34 months, the same+5·5 lb. petroleum bunker C, 80 months, chromated zinc chloride [ibid., xxv, p. 53] 48 to 55 months, the same+5·5 lb. petroleum bunker C, 95 months, and tanalith U [ibid., xxi, p. 358]+7 lb. petroleum bunker C, 83 months; the corresponding figures for squared specimens were, in the case of the first four only, 30, 59, 100, and 70 to 90 months. It is emphasized that the results indicate only the relative values of preservation. Translation into years of service life for larger material has not yet been determined. Tests with fire-retardant mixtures showed that they were not good preservatives under the conditions of these tests [cf. ibid., xxv, p. 589].

Walker (J. C.), Larson (R. H.), Foster (R. E.), & Kuntz (J. E.). **Yellows-resistant Cabbage varieties in the Danish Ballhead–Hollander group.**—*Circ. U.S. Dep. Agric.* 776, 12 pp., 3 figs., 1948.

During the ten years since it has been in commercial use, the Wisconsin Ballhead cabbage variety, which is resistant to yellows (*Fusarium oxysporum* f. *conglutinans*) [*F. conglutinans*: *R.A.M.*, xiv, p. 732; xxii, p. 291], has exhibited some undesirable characters. By means of continuous selection and back-crossing for several generations a greatly improved strain from a cross between Wisconsin Ballhead and Wisconsin Hollander has been developed and is designated Improved Wisconsin Ballhead. Following large-scale tests in 1944 and 1945, it was released in 1946 for increase and commercial distribution. The purpose of this circular is to delineate the salient features in which the new strain either resembles or differs from Danish Ballhead [ibid., xiv, p. 485], Wisconsin Ballhead, Penn State Ballhead [ibid., xxii, p. 234], Wisconsin Hollander, and Bugner. The differential characters of the several varieties are described and presented in tabular form. In Improved Wisconsin Ballhead the undue precocity of Wisconsin Ballhead has been corrected by lengthening the season about a week to coincide with that of the Danish Ballhead parent, and the tendency to burst very readily has been reduced. In respect of resistance to yellows the improved strain excels Wisconsin Hollander and Bugner, since it carries the high type of resistance (A), controlled by the dominant gene *R.*

HANSEN (H. P.). **A preliminary account of experiments and observations in Denmark 1946 concerning virus yellows of the Beet plant.**—8 pp., Copenhagen, Nielsen & Lydiche, 1947.

In this paper, presented at the tenth meeting of the 'Institut International de Recherches Betteravières', Brussels, in February, 1947, the author describes his observations and experiments on virus yellows in Denmark [*R.A.M.*, xxv, p. 135]. The work was started in October, 1945, at the instigation of the Danish sugar manufacturers after a season of heavy losses from the disease.

Of the possible vectors of the virus, namely, the spores of the common beet pathogens, *Ramularia betae*, *Uromyces betae*, *Peronospora schachtii*, and *Phoma betae*, pollen from infected plants, and the aphids *Myzus persicae* and *Aphis fabae*, only the two last-named gave positive results in transmission tests [cf. ibid., xxvi, p. 520]. The virus was not transmitted by juice inoculation or by contact, or through the seed from diseased plants. Other potential sources of virus yellows were the refuse of diseased crops after threshing, soil and farmyard manure, certain perennial weeds, and living infected plants, of which the last-named alone proved capable of spreading infection. Thus, the outcome of the present investigations on this aspect of virus yellows agrees with the results obtained in other countries on what is evidently the same disease.

Two surveys were undertaken, covering most of the country. The first, from 12th July to 5th August, comprised beet fields along a stretch of 3,000 km., including 55 seed fields and adjacent current-season beet crops. During July only 21 cases of yellows were observed, all in the incipient stage, 16 being in immediate proximity to seed fields and four a little farther away, while one was near a beet clamp. The first severe and widespread attacks were observed early in August, and others occurred at the beginning of September, after which there was little increase in the percentages of infection. The main spread of the virus apparently took place from about mid-June to the beginning of August. On the second journey from 28th August to 26th September, covering beet fields for a distance of 5,000 km., counts of infection percentages were made in 600 localities; in over 100 of these specifically examined the disease in almost every case was more prevalent in crops near seed fields than in those at a distance.

Besides proximity to seed fields, the relative suitability of the climatic and ecological conditions in different regions for the migration and propagation of aphids, especially *M. persicae*, is an important factor determining the severity and extent of virus yellows in a given locality [cf. ibid., xxv, p. 311]. General cultural methods may also strongly influence the incidence of infection, as shown by the results of a large combined experiment comprising sowing dates, fertilizing, and spraying. On 2nd August the whole area under observation showed 4·3 per cent. yellows, which had risen to 60 per cent. by 13th September, the source of infection being evidently a seed field about 600 m. away. On the latter date the percentage of infection in plots sown on 1st and 15th April and 1st and 15th May were 38·2, 53, 70, and 79·1, respectively. It was observed in several instances that seed fields sown in the early spring of 1945 in 'covering crops', such as barley, developed scarcely any yellows in 1946, whereas those sown in pure culture in July, 1945, were heavily infected in the next year. It seems unlikely that early sowing alone would confer such powerful protection, especially in a year of heavy yellows infestation like 1945, and the effect was probably largely due to the alteration of the microclimate by the barley crop. Neither fertilizing nor spraying with a mixture of nicotine and DDT, or with Bordeaux, exerted any beneficial influence on the course of the disease.

Marked varietal differences were observed, however, in an experiment comprising 21 beet stocks. The percentage of infection in four sugar beet stocks ranged from 7 to 25, with an average of 17, the corresponding figures for 11 sugar beet×

mangold being 4 to 13 and 7, respectively, and for five mangold 2 to 7 and 4, respectively.

SYLVESTER (E. S.). **The yellow-net virus disease of Sugar Beets.**—*Phytopathology*, xxxviii, 6, pp. 429–439, 2 figs., 1948.

Yellow net, a previously undescribed virus disease of the sugar beet, was first observed on Sherman Island, northern California, in June, 1945. Specimens have since been received from Isleton, Mt. Eden, and the Rio Vista area. At present diseased plants found in the field are few in number and relatively isolated. They exhibit a bright-yellow chlorosis of the veins which starts in the main lateral veins of the youngest leaf. These symptoms often vary in intensity and in the lateral dispersion of the chlorosis from the veinlets into the adjacent tissues. In inoculated plants the net chlorosis is frequently preceded by the appearance of one to several scattered yellow spots, usually circular and measuring 1 mm. in diameter. The extent of the chlorosis varies as with naturally infected plants. In some cases the chlorosis diffuses from the veinlets into adjacent mesophyll areas. This diffusion may increase in older leaves, the areas of spreading chlorosis coalescing until the leaf blade is completely chlorotic, varying from cream to golden yellow. As the inoculated plants grow older the symptoms tend to become milder, or even disappear although the virus is still present and capable of inducing typical symptoms. Further symptom variations occur when leaves are partially or asymmetrically affected.

The virus could not be transmitted by mechanical inoculation methods. One of five healthy beets developed yellow net symptoms two weeks after green aphids (*Myzus persicae*) had been transferred to them from diseased plants. In a similar experiment one of five inoculated plants showed symptoms after 24 days.

Based on 169 random examples, the minimum incubation period required for the appearance of the first symptoms on young beet seedlings was nine days and the average 24 days. The virus becomes available to a previously non-infective vector at a minimum of eight days following inoculation. The virus persists in the vector throughout its experimental life.

In order to discover any interaction between yellow net and other viruses commonly affecting sugar beet in California five beets infected with yellow net were inoculated with beet mosaic virus. Within 11 days only mosaic symptoms were evident on the new leaves. After one month non-viruliferous *M. persicae* were placed on each plant. After a 10-day feeding period the colonies were transferred to a series of five healthy beet seedlings for three days. The yellow net virus was recovered from the series of each succeeding day but the mosaic virus from the first only. In the same way the yellow net virus induced no symptoms in the newly formed leaves of infective beets inoculated with the beet curly top virus, but was recovered by means of aphids, the curly top virus being recovered by means of sugar beet leaf hoppers (*Eutettix tenellus*). These tests indicate that all three viruses are distinct.

The following varieties of sugar and garden beets are susceptible, U.S. 15, U.S. 22 (improved), U.S. 23, U.S. 33, G.W. 49, Detroit Dark Red, and Early Wonder and also Swiss chard (*Beta vulgaris* var. *cicla*), the last-named showing typical yellow net symptoms.

GROGAN (R. G.) & WALKER (J. C.). **Interrelation of Bean virus 1 and Bean virus 2 as shown by cross-protection tests.**—*Phytopathology*, xxxviii, 6, pp. 489–493, 1948.

Cross-protection tests were made at the University of Wisconsin to determine whether common bean mosaic [*R.A.M.*, xxvii, pp. 119, 456] and yellow bean mosaic [ibid., xxvi, p. 275] viruses should be regarded as distinct or as strains of a

single virus. Stock cultures of the viruses were maintained, the former in Stringless Green Refugee and the latter in Sensation Refugee 1066 bean [*Phaseolus vulgaris*] plants, grown from virus-free seed in the greenhouse. Sensation Refugee 1066 is highly resistant to common mosaic. Stringless Green Refugee, which is susceptible to both viruses, was used as test plant.

Common mosaic was shown to immunize beans effectively against infection by yellow mosaic and the latter immunized beans partially or entirely against infection by the former virus. Yellow mosaic also reduced the amount of seed transmission of common mosaic and the amount of systemic necrosis caused by this virus in certain resistant varieties. In view of these results and the fact that the viruses have very similar dilution and thermal inactivation end points and longevity *in vitro* [ibid., xiii, p. 489] they are regarded as closely related. They differ chiefly in host range and in the fact that common mosaic is transmitted in bean seed while yellow mosaic is not.

YARWOOD (C. E.). **Therapeutic treatments for rusts.**—*Phytopathology*, xxxviii, 7, pp. 542–551, 3 graphs, 1948.

Bean [*Phaseolus vulgaris*] and sunflower plants inoculated with the uredospores of their respective rusts (*Uromyces phaseoli* and *Puccinia helianthi*), placed in a moist chamber, and returned to a dry atmosphere at varying intervals, showed no subsequent infection when the plants were dried two hours after inoculation, but increasing amounts developed with incubation periods up to about 18 hours before drying. When infected plants were sprayed with surface applications of 2 per cent. rosin lime-sulphur [*R.A.M.*, xxvii, p. 247] or 0·1 per cent. copper sulphate plus spreader, subsequent infection was inversely proportional to the interval between inoculation and spraying for periods between 18 and 90 hours after inoculation. Penetrating applications of dilute lime-sulphur were effective in the eradication of bean rust up to eight days after inoculation with little damage to the host, and the efficacy of these treatments was enhanced with increasing lime-sulphur concentrations from 0·01 to 3 per cent., with the addition of a spreader or zinc sulphate (optimum between 0·02 and 0·5 per cent.) to the lime-sulphur spray, and with enclosure in a moist chamber after spraying.

The rusts of bean and snapdragon (*P. antirrhini*) were eradicated by exposures of 15 minutes and 12 hours, respectively, to cyanide gas at concentrations ranging from 70 to 2,000 p.p.m., but the treatment usually caused host injury. The vapours from lime-sulphur solutions (0·001 to 100 per cent. lime-sulphur) eradicated *U. phaseoli* from four- and seven-day-old infections, the maximum therapy being derived from a 0·1 per cent. concentration of the compound. The optimum alkalinity for the volatile therapeutic action of 0·1 per cent. lime-sulphur or 0·05 per cent. sodium sulphide was about pH 9.

Four- to ten-day-old bean rust infections were destroyed without appreciable host injury by periods of immersion in hot water ranging from 0·06 minutes at 55° C. to 80 minutes at 35°, the data indicating a temperature coefficient (ratio of immersion times for equivalent lethal effect over a range of 10°) of about 44 between these temperatures, while mint rust (*P. menthae*) [ibid., xxv, p. 232] succumbed to 12 seconds at 50° or four at 55° without injury to the host. *P. antirrhini* was eradicated by hot-air dosages ranging from 30 minutes at 46° to 40 hours at 34°, with a temperature coefficient of approximately 20.

WELCH (A. W.) & GILMAN (J. C.). **Hetero- and homothallic types of Diaporthe on Soybeans.**—*Phytopathology*, xxxviii, 8, pp. 628–637, 3 figs., 1948.

In the course of soy-bean disease investigations at the Iowa Agricultural Experiment Station in 1946, two members of the genus *Diaporthe* were found differing in pathogenicity and type of perithecial development. One was hetero-

thallic with scattered single perithecia, while the other was homothallic with caespitose perithecial clusters. The former, recognized as *D. phaseolorum* var. *sojae* [*R.A.M.*, xxvii, p. 55], produced typical *Phomopsis* conidia of the alpha and beta types, while the latter, referred to *D. p.* var. *batatatis* [ibid., xiii, p. 270], lacked the imperfect state. The homothallic variety actively attacked the stems, causing wilting and death, while the heterothallic was less pathogenic, occurring mainly on mature plants and producing linear rows of pycnidia on the branches and stems.

Yu (T. F.) & Fang (C. T.). **Fusarium diseases of Broad Bean. III. Root-rot and wilt of Broad Beans caused by two new forms of Fusarium.**—*Phytopathology*, xxxviii, 8, pp. 587–594, 1 fig., 1948.

Continuing their studies on the destructive foot and root rots and wilt of broad beans prevalent in Yunnan, China [*R.A.M.*, xxviii, p. 550], the writers describe the cultural and morphological features and pathogenicity of two new forms of *Fusarium* concerned in the etiology of these diseases. *F. solani* f. *fabae* n.f. is responsible for the typical root rot and *F. oxysporum* f. *fabae* n.f. for wilt. The former differs from the saprophytic or weakly parasitic *F. solani* solely in its virulent pathogenicity, which was confined, however, to the original host in inoculation experiments, beans [*Phaseolus vulgaris*], peas, cowpeas, oats, wheat, and maize remaining immune. The new form of *F. oxysporum* closely resembles the species, and more especially *F.o.* f. *pisi* as described by Wollenweber and Reinking [ibid., xiv, p. 708]. Two cultures of the pea fungus, one from the United States and the other isolated from the same host in Yunnan, were used in cross-inoculation experiments, the results of which indicated that *F.o.* f. *pisi* may occasionally attack broad bean, whereas *F.o.* f. *fabae* is non-pathogenic to peas, as well as to the other above-mentioned legumes and cereals.

Rader (W. E.). **Rhizoctonia carotae n.sp. and Gliocladium aureum n.sp., two new root pathogens of Carrots in cold storage.**—*Phytopathology*, xxxviii, 6, pp. 440–452, 4 figs., 1 graph, 1948.

Surveys of stored carrots in New York State during 1943–6 revealed two diseases caused by two new species of fungi which, in some seasons, may damage 5 to 10 per cent. of the crop during storage.

Rhizoctonia crater rot has been found only on roots kept in cold storage for two to three months. It appears first on the roots as small, whitish hyphal knots under which small pits develop. At this stage a microscope is needed for positive identification of the pathogen. The pits enlarge into craters lined with a flocculent white mycelium, and, in stores with high relative humidities, the disease spreads rapidly until entire crates are covered with white mycelium. At this stage the fungus is distinguishable from *Sclerotinia sclerotiorum* by the absence of sclerotia and by the looser, weft-like mycelium. The decayed tissues beneath the surface lesions are light brown and usually firm. The characteristic symptoms of crater rot soon become obliterated by more rapid growing secondary invaders, such as *S. sclerotiorum* and *Botrytis cinerea*.

The typical firm rot was obtained by tissue inoculations, but the characteristic pitting was produced in the laboratory with difficulty. The pathogen was always recovered from the lesions. *Rhizoctonia carotae* n.sp. is described as having hyaline to slightly brownish, richly branched, septate hyphae measuring 2·5 to 5 (average 4·1) μ in diameter, with 1 to 5 clamps at the septa. The irregular, golden-yellow to brownish sclerotia, formed loosely in the hyphae, measure 2·5 mm. in diameter. The sclerotial cells are hypha-like when young and barrel-shaped when old and germinate by a proliferation at one side. They have brownish to yellow walls and measure 4·1 to 7·1 (average 5·1) by 4·6 to 9·1 (6·2) μ. On agar the organism

grew well over a temperature range of from —4° to 24° C. (optimum 21°). Infection of carrots by artificial inoculation was obtained from 0° to 15°. Celery, beet, potato, parsnip, and rutabaga [swede] were not infected.

Lower incidence of crater rot occurred in carrots stored in clean or disinfected crates and placed in storage rooms maintained at 0° C. and at a relative humidity of 90 to 95 per cent.

Gliocladium rot was often encountered in carrots in cold storage in Monroe and Wayne Counties, New York, but losses were never severe. The lesions appear on the sides of the roots as shallow, slightly sunken cankers sparsely lined with light yellowish to pinkish mycelium. Affected tissues are very hard and leathery and light brown. The affected area is frequently covered with a thick mat of mycelium. The characteristic lesions are readily masked by secondary invaders. The symptoms are very similar to those produced by *Fusarium avenaceum* [*R.A.M.*, xvii, p. 96] with which the *Gliocladium* is frequently associated.

Although the general morphology of this pathogen places it close to *G.* (*Penicillium*) *roseum*, it is distinguished by its curved conidia and active pathogenicity and is therefore designated *G. aureum* n.sp. On potato dextrose agar the colonies are pure white at first, later pale yellow, and occasionally light salmon to pink in the fruiting areas on Czapek's medium. The loose to floccose mycelium is composed of simple or bundled hyphae. The conidiophores measure 40 to 120 μ, and the penicillia up to 130 μ in length; they are occasionally irregularly, alternately branched. The phialides, measuring 10 to 15 by 2 to 3 μ, bear hyaline, elliptical, apiculate, smooth conidia, aggregated in balls (*Acrostalagmus* type) or agglutinated in columns (*Clonostachys* type) and measuring 3·3 by 5·9 (extremes 2·6 to 3·6 by 5·1 to 6·7) μ.

The optimum temperature for *G. aureum* lies between 21° and 24°, the minimum below —3°, and the maximum between 33° and 36°. Infection has been obtained consistently on inoculated roots incubated in moist chambers at 6° and 21°.

Wilson (J. D.). **Report of the special committee on the co-ordination of field tests with new fungicidal sprays and dusts, with reference to results obtained in 1947.**—*Plant Dis. Reptr, Suppl.* 174, pp. 41–86, 1948. [Mimeographed.]

The committee, organized towards the end of 1946, consists of a general chairman, J. D. Wilson, seven subchairmen, each of whom is responsible for tests conducted on a specific crop, and eight advisory members. Individual co-operators were chosen from each State agricultural experiment station to assist in the testing of a selected group of new fungicides [cf. *R.A.M.*, xxvii, p. 573] for the control of specific diseases on a specific crop or group of crops. Five or six treatments with four to six replicates of each treatment were standardized for each crop and the data obtained assembled and submitted as the yearly report of the committee as a whole. A list of fungicides and the crops on which they were used is supplied.

A. G. Newhall and J. D. Wilson report that in a carrot-spraying test at McGaffey, Ohio, of the materials used to control *Cercospora* leaf spot [*C. carotae*: ibid., xxvi, p. 441], Bordeaux 6–6–100 gave the best control of spotting followed by zerlate 2–100, while these and parzate (2–100), dithane Z–78 (2–100), and bioquin 1 (1–100) gave significant increases in yield.

J. W. Heuberger reports that according to results received from eight co-operators the copper fungicides gave better control of downy [*Pseudoperonospora cubensis*: ibid., xxvii, p. 346] and powdery mildew (*Erysiphe cichoracearum*) of Hales Best cantaloupe in South Carolina, Delaware, and Maryland, and also of cucumbers in North and South Carolina and Delaware than the dithiocarbamates while the latter, especially zerlate, gave better control of anthracnose of honeydew melons [*Colletotrichum lagenarium*: ibid., xxiv, p. 356] in South Carolina and also of *Mycosphaerella citrullina* and *Choanephora cucurbitarum* [ibid., xxvi, p. 379] on

squash in Massachusetts. Zerlate was thus shown to have a definite place in the cucurbit disease-control programme.

Allen (M. W.). **Relation of soil fumigation, nematodes, and inoculation technique to big vein disease of Lettuce.**—*Phytopathology*, xxxviii, 8, pp. 612–627, 1948.

Inconclusive or negative results were obtained in experiments at Berkeley, California, on lettuce big vein [*R.A.M.*, xxv, pp. 368, 486] transmission by 12 species of nematodes. The virus was also not transmitted to healthy seedlings by rubbing the leaves, in the presence of carborundum, with freshly extracted root juice from infected plants: apparent cases of transmission by this means were shown to result from soil contamination with the inoculum. The available evidence indicates that big vein infection occurs exclusively through the roots. The symptoms developed in lettuce grown in virus-free soil inoculated with extracted root juice and chopped roots of infected plants, apparently as a result of root contact with soil contaminated by the virus and in the absence of any probable vector or intentional injury to the roots.

The big vein virus is inactivated in the soil or root juice extracts by half an hour's exposure to a temperature of 60° to 65° C., as well as by the fumigation of infected soil with chloropicrin at 0·23 ml. or dichloropropene–dichloropropane mixture at 0·46 ml. per gal. soil. The virus retains its infectivity in root juice extracts diluted at least 1 in 200,000 with water.

Ashdown (D.) & Watkins (T. C.). **Control of Lettuce yellows disease in New York.**—*J. econ. Ent.*, xli, 2, pp. 252–258, 1948.

Preliminary tests on the cloth screening of lettuce from attack by six-spotted leafhoppers (*Macrosteles divisus*), the vector of aster yellows virus, showed protection to be necessary from the time of emergence of the plants until they were well over half-grown in order to effect any appreciable control of the yellows disease. The losses from this source in the Oswego, Genesee, and Orange counties of New York State were estimated by the writers at over 50 per cent. for 1946 and slightly less in 1947. DDT in the form of a 5 per cent. mechanically mixed dust proved effective when applied throughout the critical period [*R.A.M.*, xxvi, p. 436]. The best results were obtained by treatments at the rate of 35 lb. per acre per application, beginning as soon as the rows were well marked by germinating plants and repeating at five-day intervals to within an estimated three weeks of harvest.

Brown (W.) & Montgomery (N.). **Problems in the cultivation of winter Lettuce.**—*Ann. appl. Biol.*, xxxv, 2, pp. 161–180, 1948.

Four years' study on outdoor winter lettuce cultivation on a commercial scale at Slough [cf. *R.A.M.*, xx, p. 146] showed that late autumn plantings (chiefly of Imperial, Majestic, and Trocadero Improved) suffered less mortality from fungal disease (chiefly *Botrytis cinerea*, but also *Rhizoctonia* [*Corticium*] *solani*, and *Pythium* spp.) on a medium-heavy loam than on light sandy soil. Disease caused by *Marssonina panattoniana* was kept at negligible proportions by using disease-free seed and by cutting out infected patches plus 6 in. on either side of the drill. A single application of folosan [loc. cit.] in February or March to transplants overwintered in the seed-bed gave in a number of instances highly beneficial results on survival. Folosan D.B. 905 [ibid., xxvii, pp. 193, 194] usually gave better results than folosan with seedlings in frames, but folosan gave a higher survival of outdoor lettuces at maturity. Folosan D.B. 905 can be applied to seedlings in frames without visible check to growth, and may safely be used when the plants are very small to prevent damping-off (*C. solani*). Frame-reared seedlings of the Trocadero Improved variety dusted three times with folosan showed 81·2 per cent. survival,

as against only 38·2 per cent. for the undusted. At the date of planting (18th March) batches of each sort were packed in tins and kept at 10° C. for seven days, after which period, of 157 undusted lettuces 100 were apparently sound and 57 showed lesions, while of the dusted lot 156 appeared sound and none bore lesions. Of the apparently sound lettuces 11 per cent. of the undusted and 80 per cent. of the dusted survived to maturity. Sorting failed to reveal small or incipient lesions hidden among the withered leaf bases, hence the value of dusting. D.B. 905 gave similar results. These dusts should be used as preservatives when lettuce seedlings are dispatched over a distance or when, after lifting and bulking, planting has to be delayed. Over three years 1 per cent. cuprocide used as a seed dust increased emergence by an average of 35 per cent. [ibid., xvii, p. 406].

Observations on the progress of disease in the seed-beds showed that damping-off due to *C. solani* usually occurred within a few weeks of emergence. At this stage, the plants were carrying green cotyledons and were not subject to attack by *B. cinerea*. Entry of *C. solani* was normally through the hypocotyl. Later, *B. cinerea* sporulated freely on the dead plants. The incidence of *C. solani* varied markedly in intensity from one bed to another, and the reason for this requires investigation. Patches of slow-growing plants recurred sporadically throughout the winter. The tap-root, rotted at the tip, appeared as a brownish-red stump, while the finer side roots were brown and rotten. Isolations from affected roots regularly yielded a species of *Pythium* [ibid., xx, p. 146; xxv, p. 535], though infected plants did not die immediately. As the winter advanced, the root system became increasingly reduced, and the plants sometimes lay flat on the ground and died, or if good growing conditions returned, sometimes struck root again and re-established themselves, though such plants were of small cropping value. Trocadero was much more liable to this trouble than Imperial. Deterioration of seed-beds began after November and the final stands of later transplants depended on the condition of the seed-bed. By February, the gaps and damped-off patches had enlarged and new ones had formed. The predominant fungus at this stage was *B. cinerea*, sporulating freely on dead and dying plants. When the beds were prepared in ridges, deterioration was slower in the hollows than on the ridges, sowings on the flat being intermediate. The best seed-beds appear to be those on heavier soil.

The main problem emerging from these studies relates to the effect of soil type on the overwintering of lettuce seedlings. It is strongly emphasized that light sandy soil is unsuitable. Early sowing is desirable and transplanting should be done in February if possible with a single fungicidal dressing at that operation. Overwintered seedlings from mulched rows had whiter roots and were healthier than seedlings from uncovered rows. This suggests that protection of the roots from frost injury aids overwintering, increasing resistance to *B. cinerea* and may explain the different behaviour of plants in hollows and on ridges. The explanation may be in microbiological antagonism. The entry of *B. cinerea* into the stem being through decayed leaf bases, any factor encouraging development of saprophytes in these dying parts would help to prevent *B. cinerea* from reaching the stem. Earthing up of the leaf bases would assist this action, and this may account for the better survival in hollows than on ridges, the effect of mulching, and the differential values of light and heavy soils for overwintering.

Losses due to mosaic [ibid., xxvii, p. 214] were usually under 5 per cent., but in 1945–6 were higher, reaching 10 to 20 per cent. in Trocadero. No sign of mosaic was seen on 1,442 seedlings from infected plants.

Baker (K. F.). **Disease-free seedlings.**—*Flor. Rev.*, cii, 2627, pp. 31–32, 1948.

Since damping-off caused by *Rhizoctonia* [*Corticium solani*: *R.A.M.*, xxvii, p. 346] and other fungi can now be practically eliminated in commercial [chilli] pepper seedling nurseries in southern California by soil steaming, new mechanized produc-

tion techniques are being developed and adopted. They include mechanical flat fillers which receive, by conveyor belts, the various soil components ready mixed and fill 900 flats per hour, steel rollers to convey the pasteurized flats into drop-sided greenhouses, and a patented vacuum-plate seed-sowing machine. The seeds (previously hot-water treated) are covered with tissue paper and then sterile sand and heavily watered. They are transported to the germination room at the rate of 150 flats per hour. Seedlings handled in this manner may be grown safely in greenhouses having a high temperature (80° F.) and humidity and high levels of soil moisture and fertility, and they require only 50 days from seeding to hardening-off. Transplanting and the hazard of spreading virus diseases by handling which accompanies this process are eliminated. Such plants are also suitable for machine planting. The success of these mechanized methods depends on the use of clean soil and seeds and on rigorous sanitation without which losses may actually be increased.

Daines (R. H.). **Scurf, black rot, and stem rot of Sweet Potatoes.**—*Circ. N.J. agric. Exp. Sta.* 514, 8 pp., 2 figs., 1948.

This new edition of circular 437 deals with the three destructive sweet potato diseases in New Jersey, namely, scurf [*Monilochaetes infuscans*: *R.A.M.*, xxii, p. 419], black rot [*Ceratostomella fimbriata*: ibid., xxvii, p. 176], and stem rot [*Fusarium* spp.: loc. cit.]. The symptoms and control measures, which include seed and sprout treatments and seedbed sterilization, are briefly discussed.

Person (L. H.), Olson (E. O.), & Martin (W. J.). **Effectiveness of fungicides in controlling black rot of Sweet Potatoes.**—*Phytopathology*, xxxviii, 6, pp. 474–479, 2 figs., 1948.

Owing to the increasing damage by black rot of sweet potatoes (*Ceratostomella fimbriata*) [see preceding abstract] to the early crop in Louisiana, 17 compounds were tested over a period of five years in an attempt to find an effective fungicide [*R.A.M.*, xxvi, p. 528] suitable for application after the washing process.

Samples of the variety Porto Rico were washed, dipped in a heavy spore suspension of *C. fimbriata*, and immersed for about 30 seconds in a solution of the fungicide to be tested. They were then placed in paper-lined crates and examined for black rot lesions after 15 days. The following compounds gave satisfactory control of black rot compared with the untreated tubers: borax at 0·63 per cent. or stronger, dithane D 14 at 0·5 per cent. or stronger, 0·2 per cent. dithane Z 78, 0·1 per cent. mercuric chloride, 1·5 per cent. phygon, 0·5 per cent. puratized N5E, 0·2 per cent. puratized N5D, and 1·5 per cent. thiourea. The two first-named were the most effective provided the solution was allowed to dry on the surface. Mercuric chloride and the two puratized compounds should be used only for surface-treating roots intended for bedding prior to slip production. Concentrations of borax as low as 0·1 per cent. caused a marked reduction in black rot lesions.

Market potatoes showing no evidence of black rot, but selected from a load with evidence of the disease, were washed, divided into four groups, and treated as follows: (*a*) untreated, (*b*) dipped in a 1·3 per cent. solution of dithane D 14, (*c*) and (*d*) dipped in 1 and 0·6 per cent. borax solutions, respectively. The average number of lesions per potato which developed were 0·25, 0·03, 0·03, and 0·05, respectively. No chemical injury resulted to potatoes treated with borax solutions below 2·5 per cent. Severe burning occurred on bruised potatoes treated in a 1·3 per cent. dithane D 14 solution.

From these experiments it appears that there are definite possibilities for the commercial use of borax and perhaps dithane D 14 at concentrations of about 1 per cent. for controlling black rot on uncured sweet potatoes.

Padmanabhan (S. Y.). **A new seedling disease of Brinjals.**—*Indian J. agric. Sci.*, xvii, 6, pp. 393–395, 1 fig., 1948.

In November, 1945, a disease causing leaf spots in brinjal [eggplant] seedlings was found in the Departmental seedling nursery at Jessore, Bengal. The small, brown spots, somewhat angular at first, enlarge to become circular or elliptical or irregularly elliptical, with a well-defined margin. The centres of older spots become papery and translucent and sometimes shot holes are also formed. On enlargement the spots are mainly confined between the principal lateral veins of the leaf.

The causal fungus, a species of *Ascochyta*, is described as having numerous, half-immersed, globose, subglobose to slightly irregular, brownish, somewhat papillate and distinctly ostiolate pycnidia measuring 90 to 217 (average 151) μ in diameter, with a pycnidial wall of thin, brown, parenchymatous cells. The non-septate spores, ellipsoidal with rounded ends or somewhat cylindrical with rounded or blunt ends measure 4 to 11 by 3 to 5 μ; on development they become uniseptate, slightly elongated and cylindrical, with stout walls, constricted at the septum and each cell biguttulate, and measuring 11 by 4 (with a range of 10 to 13 by 3 to 5) μ.

Tabulated descriptions are given of the species of *Ascochyta* on eggplant and those already reported on Solanaceae. The Bengal species is held to be distinct. Its spore measurements were exceeded only by those of *A. physalina* which were about twice the size of any other species. The spores are distinguishable from those of *A. solanicola* in being very much stouter, in their constrictions at the septal region, and in the presence of guttulae in the cells. The fungus is therefore designated as *A. melongenae* n.sp.

The disease was completely controlled by plucking out affected leaves in the beds and spraying the seedlings once with $\frac{1}{2}$ per cent. Bordeaux mixture.

Buchwald (N. F.). **Champignonskimmel (Dactylium dendroides) paavist i danske Champignonkulturer.** [Mushroom mould (*Dactylium dendroides*) observed in Danish Mushroom cultures.]—*Gartnertidende*, lxiv, pp. 363–366, 6 figs., 1948.

Early in May, 1948, the writer's attention was drawn to a mushroom disease characterized by the development overnight of a white gossamer coating covering the fruit bodies and looking almost like rime. It was full of conidiophores containing numerous conidia of *Dactylium dendroides* [*R.A.M.*, xxvi, p. 437]. The fungus has not yet been mentioned in Danish phytopathological literature, though it has occurred on several occasions during the past ten years, sometimes in a virulent form. According to W. Christensen (Champignondyrkning: Det kgl. danske Landhusholdningsselskab, Copenhagen, 1948) the onset of the disease is promoted by moisture condensation in conjunction with cold air, an unavoidable condition in houses heated exclusively by means of hot air. Severe attacks in summer cultures do not develop until September, when warm, dry days alternate with cold nights and ventilation is freely admitted during the latter. Infection appears to originate for the most part from overwintering mycelium on mushroom remnants in the soil. Strict hygiene in the beds is therefore the most important precaution. Soil disinfection with formalin (1 in 9) is usually recommended for direct control, but Kligman has reported good results from the use of chloropicrin in the United States [*R.A.M.*, xxii, p. 160], while Treschow's method for the extirpation of *Mycogone perniciosa* by one or two applications of 1 l. Bordeaux mixture (1–1–50) per sq. m. between 'flushes' should also be tested. Before new cultures are laid down the houses should be fumigated with sulphur (8 kg. per 100 cu.m.).

Scott (L. E.) & Schrader (A. L.). **Effect of alternating conditions of boron nutrition upon growth and boron content of Grape Vines in sand culture.**—*Plant Physiol.*, xxii, 4, pp. 526–537, 1 fig., 2 graphs, 1947.

Experiments carried out in Maryland during 1943 showed that when boron was

withheld from two-year-old vines of the Catawba, Herbert, Golden Muscat, and Lindley varieties grown in sand in the greenhouse [*R.A.M.*, xxiii, p. 206], deficiency symptoms appeared within 30 days of the commencement of growth. Normal growth was resumed within ten days of adding boron to the culture solution. Only those leaves which were in a meristematic condition at the time of development of the deficiency showed deficiency symptoms. The older basal leaves on boron-deficient vines remained normal in appearance even though the terminal leaves exhibited extreme symptoms. The boron concentration in deficient plants was 20 to 25 p.p.m. in all parts, while in healthy leaves it ranged from 57 to 146 p.p.m.

Suit (R. F.). **Effect of copper injury on Concord Grapes.**—*Phytopathology*, xxxviii, 6, pp. 457–466, 1948.

Following the observation, in 1940, that neutral copper fungicides having a copper content equal to that in a 4–4–100 Bordeaux mixture would cause injury to Concord grapes [*R.A.M.*, xxv, p. 330], an investigation was carried out at Fredonia, New York State, from 1941 to 1944 to determine the factors involved. A block of 80-year-old Concord grapes was divided into duplicate plots of 30 vines each. The complete schedule consisted of six applications, starting at the 3- to 4-leaf stage. Either rosin fish oil soap or S.E.C. (self-emulsifying cottonseed) oil was added to the fungicide. No diseases were present during the investigation.

Injury caused by neutral copper fungicides is characterized by small, yellowish leaves, reduced cane growth, and reduced yield. All the neutral coppers used, namely, tribasic copper sulphate, copper compound A, basicop, yellow cuprocide, and cuprocide 54-Y were injurious; tribasic and yellow cuprocide caused a significant reduction in cane growth, yield, and size of bunches. No copper injury was apparent on vines sprayed with neutral coppers having a concentration of not over $\frac{1}{2}$ lb. metallic copper per 100 gals., or at higher concentrations provided that 1 lb. hydrated lime was added for each $\frac{1}{4}$ lb. metallic copper per 100 gals. Although there was no significant difference in the yield between individual plots sprayed with Bordeaux 2–2–100, 4–4–100, or 8–8–100, all had a significantly lower yield on the four-year average compared with the controls sprayed with lead arsenate and lime. No visible symptoms of copper injury were present, however. The spray treatments ranked in order of decreasing injury as follows: neutral coppers, Bordeaux mixture, neutral coppers plus lime, and non-sprayed.

Wet weather is probably the principal factor influencing the occurrence of copper injury on grapes. An examination of the weather records during the four years of the test showed that there were about 50 days with 0·01 in. or more rain during May, June, July, and August in 1942 and 1943 when visible symptoms of copper injury appeared early in the season.

Zogg (H.), Horber (E.), & Salzmann (R.). **Pflanzenschutz.** *Ex* **Bericht über die Tätigkeit der Eidg. landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon pro 1946/47.** [Plant protection. *Ex* Report on the work of the Federal Agricultural Experiment Station Zürich-Oerlikon for 1946–7.]—*Annu. agric. Suisse*, xlv, 5, pp. 460–469, 1 fig., 1948.

During the period under review [cf. *R.A.M.*, xxvii, p. 220] mildew of cereals [*Erysiphe graminis*] was fairly prevalent, especially on barley. As usual, foot-rots (*Ophiobolus graminis*, *Cercosporella herpotrichoides*, and *Fusarium* spp.) caused heavy damage to wheat and barley in the absence of a proper system of crop rotation. Wheat bunt (*Tilletia tritici*) [*T. caries*] occurred in such a virulent form in some fields that the crop could only be used as fodder. This is attributed to a faulty method of seed treatment.

Early blight of potatoes (*Alternaria solani*), though widespread, caused no apparent damage to the plants, but its after-effects were very noticeable on stored

potatoes, especially of the Bintje variety. Presumably the fungus entered the tubers through wounds inflicted while lifting the crop. After several years of sporadic development, 23 new foci of potato wart (*Synchytrium endobioticum*) were notified in 1947, of which 20 were located in the mountain valley of Einsiedeln. In no case was newly imported 'seed' responsible for the outbreaks, all of which could be traced to old centres of infection [ibid., xxv, p. 25]. The sudden recrudescence of the latter points to the urgent need for thoroughness in the application of control measures and supervision for a period of years of the plots once infested. It also lends fresh impetus to the efforts in progress for the replacement of the susceptible Swiss varieties by wart-immune selections. Scab (*Actinomyces* [*scabies*]), normally unimportant in Switzerland, was exceptionally prevalent in 1946–7. The improved soil aeration due to weather conditions was probably the main contributory factor in the increase of the pathogen, which was particularly injurious to the Bintje and Ideal varieties. On the other hand, the incidence of virus diseases in 2,800 plots belonging to the potato-breeding societies fell to 9·6 per cent. in 1947 as against 34·7 in 1946. The principal reason for the decline was the rainy, cool weather during the summer of 1946, which checked the spread of the aphid vectors, while increased imports of foreign 'seed' also helped to limit the amount of infective material.

The mildews of fodder plants attracted much attention. Clover was severely attacked by *Erysiphe martii* [ibid., xxvi, p. 317], lucerne by *E. pisi*, and grasses by *E. graminis*.

Report of the Division of Mycology.—*Sci. Rep. agric. Res. Inst. New Delhi, 1945–6*, pp. 79–88, 1948.

The five fungicides tested during the period under review [cf. *R.A.M.*, xxvi, p. 44] for the control of barley covered smut (*Ustilago hordei*), viz., sulphur, Baluchistan sulphur, copper carbonate, agrosan G, and formalin dust, reduced the percentage of infection from 27·93 in the untreated plots to 0·24, 0·18, 0·12, 0·08, and 0·02, respectively. The same preparations absolutely eliminated jowar [sorghum] grain smut (*Sphacelotheca sorghi*), with the exception of formalin dust, which left a trace (0·1 per cent.) as against 6·4 per cent. in the control plots.

For the third year in succession the I.P. 80 and I.P. 41 pigeon pea varieties proved resistant to *Fusarium udum* in inoculation tests.

Late blight (*Phytophthora infestans*) appeared on the potato crop at Kufri, in the Simla Hills, about the third week of July, 1945. Twenty-two hybrids among those tested for their reactions to inoculum consisting of this naturally infected material proved to be resistant and 60 susceptible. Studies are in progress on an apparently new species of *Phytophthora* isolated from potato tubers showing symptoms resembling those of late blight. Yet another species of the same genus, causing a wet foliar rot of potatoes in the Simla district, develops earlier than *P. infestans* and its symptomatology is quite distinct. Isolates of this pathogen are also under observation.

At the request of the Plant Pathologist to the United Provinces, a large number of tubers of different potato varieties infected by *Alternaria solani* were planted in Delhi to determine whether the fungus is transmitted through the 'seed'. The tubers germinated normally and produced a sound crop. Two distinct forms of early blight were observed at Simla. In one the necrotic area was a clearly defined, brown spot, while in the other it was diffuse, blotchy, and of a blackish colour. No morphological differences were observed between the isolates of *A. solani* from plants showing the two types of symptoms, and both induced the blotchy form of infection when inoculated into potato and tomato [cf. ibid., xxvii, p. 89].

Darjeeling Red Round, Gola, Up-to-Date, and Phulwa potatoes showing various symptoms indicative of virus infection were found, by means of tests with differen-

tial hosts, to harbour *Solanum* viruses 1, 2, and 3 [potato virus X, potato virus Y, and potato virus A, respectively], either singly or combined, while *Solanum* virus 6, closely related to [or a strain of] potato virus X, was recovered for the first time from Phulwa plants with necrotic spots on the leaves [ibid., xxvii, p. 91].

The annual inspection of the potato crops for seed certification disclosed 55 to 70 per cent. 'negligible' and 2·5 to 23 per cent. severe mosaic in the Kumaon Hills, the corresponding figures for the Chakratta Hills being 24·5 to 46 and 8 to 20 per cent., and for the Simla Hills from 24 to 37 and up to 40 per cent.

The results of inoculation experiments on 24 sugar-cane varieties with isolate No. 78 of *Colletotrichum falcatum* [*Physalospora tucumanensis*] showed three to be fairly resistant, viz., Co. 349, Pansahi, and Chunee, with a linear spread of infection of less than 15 in.; three highly susceptible, Co. 312, 244, and 233 (up to 40 in.); and the remaining 17 moderately susceptible (15 to 30 in.).

Brief notes are given on the taxonomic studies accomplished or in progress on the Indian rusts, smuts, and other fungi.

Beattie (A. G.). **Annual Report, Agricultural Department, Nigeria, 1945.**—38 pp., 1948.

In this report [cf. *R.A.M.*, xxv, p. 494] it is stated that the Indian method of controlling guinea-corn [sorghum] smut [*Sphacelotheca sorghi*: ibid., xxvii, p. 18] was compared experimentally with the practice normally adopted in Nigeria of dusting with copper carbonate. Seed from badly smutted heads dusted, water-treated, or untreated produced plants having, respectively, 1·8, 32, and 39 per cent. smutted heads. The dusted seed yielded 1,430 lb. per acre, a significant increase of 20 per cent. over the untreated.

In the search for a cassava variety immune from mosaic [ibid., xxvii, pp. 63, 79], 24 healthy hybrid seedlings which were successfully budded from diseased plants all became infected. Further pollinations were, therefore, effected, repeating on a larger scale the combinations that have so far given the most promising progenies. Some of the seed produced was sent to the Northern Provinces for trial. Reports from southern stations indicate that the resistant hybrids so far distributed are, in general, less susceptible than the varieties in local use and appear to be acceptable as food.

An insect-proof cage was constructed in which cacao seed is regularly sown to provide stocks for grafting buds from trees showing the various Nigerian manifestations of swollen shoot [ibid., xxvii, p. 557], so that the comparative effects on the stocks may be observed. The stocks are also being used to check cases where the presence of virus is uncertain.

Report on agricultural research for the year ending June 30, 1947.—*Rep. Ia agric. Exp. Sta., 1946–47*, 363 pp. [? 1947.]

In the farm crops sub-section of this report (pp. 51–92) [cf. *R.A.M.*, xxvi, p. 379] a table shows that in 1946 nine flax varieties grown at Ames, Iowa, viz., Dakota, Custer, Cheyenne, Rocket, Bison, Arrow, Redwing, Crystal, and Victory carried, respectively, 35, 30, 25, 35, 6, 12, 14, 6, and 47 per cent. 'pasmo' disease [*Sphaerella linorum*: ibid., xxvii, p. 412], while at Kanawha the figures for the same varieties were 52, 17, 14, 7, trace, 4, 37, 2, 52 per cent., respectively.

H. C. Murphy and L. C. Burnett state that but for an estimated reduction of 25 per cent. in yield and quality of oats due to *Helminthosporium victoriae* [ibid., xxviii, p. 14] a record crop would have been produced. Nearly the whole acreage was planted with Tama, Boone, Control, and Marion, the first three of which are completely susceptible to *H. victoriae*. In 55 community trials conducted throughout the state in 1946, all the seed being treated with new improved ceresan, the average yield of Tama and Boone was 18·5 per cent. less than that of Marion and 23·1

per cent. less than Clinton. The new varieties Sac and Bonham (selected from the cross D69×Bond), Mohawk (from Bond×D67), and Shelby (from Anthony×Bond) are resistant, the last-named also possesses the same resistance as Clinton to crown rust [*Puccinia coronata*], stem [black] rust [*P. graminis*], halo blight [*Pseudomonas coronafaciens*], *H.* [*Pyrenophora*] *avenae*, and is more resistant to smut [*Ustilago avenae* and *U. kolleri*]. These varieties and also Clinton and Benton have been multiplied and distributed to several States. In view of the fact that crown rust race 45 and similar ones which attack Clinton, Benton, Mindo, Bonda, and other varieties possessing the Bond type of resistance to crown rust are likely to increase in prevalence and severity with an increase of these varieties, it is emphasized that combined resistance to these races and to *H. victoriae* is available in the oat varieties Trispernia (C.I. 4009), Klein 69B (C.I. 4118), Santa Fe (C.I. 4518 and 4519), and Landhafer (C.I. 3422).

Crown rust was again severe on older susceptible varieties throughout Iowa in 1947, but no appreciable economic loss was caused, as these occupied only about 2 per cent. oat acreage. Race 45 was present everywhere, but appeared too late to cause any appreciable damage to Clinton and other varieties susceptible to this race. Races 1, 6, and 45 were the most prevalent, and composed 73·9 per cent. of all isolates. Two new races (86 and 87) were identified.

In greenhouse tests on numerous oat varieties and selections for reaction to *Pythium debaryanum* and *P. graminicola* [ibid., xxvi, p. 380], the former was most pathogenic at 50° F., causing heavy pre-emergence loss when seed was sown in sterilized, infested soil. *P. graminicola* was most pathogenic at 80°, causing no pre-emergence deaths and only slight root necrosis. Most varieties were susceptible to *P. debaryanum* and resistant to *P. graminicola*.

In field studies by W. F. Buchholtz, I. E. Melhus, A. W. Welch, and H. C. Murphy on the retardation of growth and productivity of oats and barley by *P. graminicola* and *P. debaryanum*, it was found that on plots infested with *P. graminicola* tillering, green weight, dry weight, and seed yield were reduced particularly in the case of barley. In plots infested with *P. debaryanum* the effects were somewhat less marked. Yield reductions were greater in the plots from which rainfall was diverted. Isolations from roots, particularly barley, in chloropicrin-treated soil yielded fewer isolates of *P. graminicola* than roots from untreated or re-infested plots, and there was less root necrosis. Plants in chloropicrin-treated soil were taller, larger-stemmed, larger-leaved, and darker green than those in untreated soil. *P. debaryanum* was recovered frequently from roots of barley seedlings of all ages, sown in the greenhouse at intervals over a period of 50 days, though it tended to be less frequently recovered from roots of seedlings over 20 days old. *P. graminicola* was not recovered to an appreciable extent from seedlings under 12 days old, and only 2 per cent. of those under eight days old appeared to harbour the fungus. On the twelfth day after planting, 19 per cent. of the isolates were *P. graminicola*, the proportion rising to almost 50 per cent. on the twenty-eighth day and afterwards.

During the past two years, 72 varieties and strains of wheat have been inoculated with the races of loose smut [*Ustilago tritici*: ibid., xxvii, pp. 227, 313; xxviii, p. 13] prevalent in the central west. Nine strains showed complete resistance and of these Pawnee, Kawvale, and Early Triumph are in commercial production. The other six, C.I. Nos. 11992, 12127, 12128, 12287, 12331, and 12405, are being used as parent material in crosses.

C. P. Wilsie reports that anthracnose, of both the southern (*Colletotrichum trifolii*) and northern [*Kabatiella caulivora*] types, was the most serious disease of red clover in nurseries [ibid., xxviii, p. 18]; the former appeared to cause the greater damage. The Wisconsin variety displayed striking resistance to [? powdery] mildew [*Erysiphe polygoni*: loc. cit.].

In greenhouse and laboratory studies with *Fusarium bulbigenum* var. *niveum* [ibid., xxvii, pp. 307, 346] W. F. Buchholtz and C. S. Reddy demonstrated that very little early loss was due to this organism. *P. irregulare* [ibid., xxvi, p. 380] and *Rhizoctonia* sp. caused severe losses in artificially infested steamed soil. *P. irregulare* was isolated from embryos of watermelon seeds sown in Conesville soil maintained at 45° F. and 60 per cent. of water-holding capacity for seven days. High-moisture and low-temperature conditions resulted in reduced germination, increased seedling rot, and damping-off caused by *P. irregulare*.

W. J. Hooker, D. M. Coe, and C. S. Reddy conducted greenhouse and field tests which showed that under the experimental conditions sweet potato infection by the stem rot organism *Fusarium oxysporum* f. *batatas* [*F. bulbigenum* var. *batatas*: ibid., xxvi, p. 380; xxvii, p. 466] generally occurred at or shortly after transplanting. Pre-planting dips in semesan bel (2 oz. per gal.) moderately reduced stem rot, though stands were slightly lower than in the water control.

G. Semeniuk and D. M. Coe observed a *Pythium* root necrosis of onion seedlings and sets in the greenhouse and in various garden and field crops, sometimes abundantly present. The main and branch roots were transparent, watery, and leaden grey. The cortex was partially or completely rotted, though the endodermis and central stele were intact. In late June parts of affected roots were pink. Eighty per cent. of affected roots, whether pink or not, gave a species of *Pythium*, *Fusarium* spp., bacteria, and occasionally a species of *Phoma*. This isolation of a *Pythium* from pink and non-pink roots throws new light on the cause of the pink root disease of onions [ibid., xxvi, p. 378], and suggests that *Phoma terrestris* [ibid., xxv, pp. 333, 542, 543] may not be the initial cause of the disease everywhere.

In further studies on potato scab (*Actinomyces scabies*) [ibid., xxvi, p. 77, xxvii, p. 121], W. J. Hooker, W. F. Buchholtz, and A. T. Erwin report that applications of sulphur at 500, 1,000, 2,000, and 4,000 lb. per acre, and ammonium sulphate at 500 and 1,000 lb. per acre all reduced infection and markedly increased total yields, though chemical injury was appreciable with sulphur at rates over 500 lb. Ammonium sulphate gave the best control, with little injury. In further studies on the host range of *A. scabies*, cucumber, large cheese pumpkin (*Cucurbita moschata*), and maize showed the highest resistance, while marrow, red beet, pea, soy-bean, wheat, and oats were susceptible.

C. S. Reddy and N. Gerhold report that in experiments at Kanawha in 1946 four treatments of maize seed gave an average increase of 9·2 bush. per acre or 15·2 per cent. Very adverse conditions favoured invasion by soil pathogens, mostly *Pythium debaryanum*, *P. ultimum*, and *P. irregulare*. Modification of the slurry method indicated the possibility of sticking the dust to the seed by the addition of two pints of 40 per cent. rubber latex (omilite) per 10 gals. slurry. This affords protection to workers and loaders. With flax, new improved ceresan (2 oz. per bush.) gave the best results, increasing stands by 30·1 per cent. and yields by 11·6 per cent.; $1\frac{1}{2}$- and 1-oz. rates were not significantly less beneficial, and the 1-oz. rate was recommended. In three experiments with oats, using ten varieties in each, new improved ceresan ($\frac{1}{2}$ oz. per bush.) gave an average increase of 3·1 bush. per acre.

S. M. Dietz and R. A. Young state that a severe epiphytotic of oak wilt (*Chalara quercina*) [ibid., xxvii, p. 165] again occurred in Iowa in 1946. The north-eastern quarter of the State suffered the heaviest loss particularly on red [*Quercus spp.*], burr [*Q. macrocarpa*], and Hill's yellow [*Q. ellipsoidalis*] oaks. In some localities where no new infection had occurred in 1944 or 1945 trees adjacent to ones previously killed by the fungus became infected and died. Spread was mostly among dominant trees in any area. Seedlings and immature trees in the same area were seldom attacked. Spread either in individual trees or stands was slowest in white [*Q. spp.*] and burr oak and most rapid in red and Hill's yellow oak. Overwintering occurred

on a few scattered living red oak trees which first became infected in late autumn and on brush cut from infected trees at this season. *Q. ellipsoidalis* was demonstrated to be an overwintering host. The following additional hosts were found: *Q. falcata*, *Q. gambelii*, *Q. garryana*, *Q. hemisphaerica*, *Q. laevis*, *Q. phellos*, *Q. robur*, *Q. shumardii* var. *texana*, and *Q. suber*. The complete removal of dead trees followed by prompt destruction of newly infected trees checked spread. The pruning of infected branches some feet behind the expressed symptoms effectively controlled the disease on individual white oaks.

L. C. Burnett, H. C. Murphy, C. S. Reddy, and I. J. Johnson report that a Wisconsin 38 barley selection with unusual resistance to *Helminthosporium* blight [? *H. sativum*: ibid., xxvii, p. 511] was increased at Kanawha. Of 30 *Helminthosporium* isolates obtained from barley at Ames in 1946, 25 were identified as *H. sativum*. Of 20 barley varieties and selections tested, Mars was the least and Montcalm the most susceptible to all the *H. sativum* isolates.

A. W. Welch, I. J. Johnson, and C. P. Wilsie state that chocolate leaf spot (*Pseudomonas coronafaciens* var. *atropurpurea*) [ibid. xxvi, p. 493] caused serious damage to brome grass early in the season, while bacterial streak (*Xanthomonas translucens*) [ibid., xxv, p. 389] occurred later and to a less extent. Brown spot (*H.* [*Pyrenophora*] *bromi*) [ibid., xiv, p. 125; xxiv, p. 317] was the most destructive disease on this host.

In studies by J. F. Harrington and W. F. Buchholtz 46 tomato strains from crosses with *Lycopersicon hirsutum*, *L. pimpinellifolium*, and *L. peruvianum*, many of which had been back-crossed to commercial varieties, were retained after rigorous selection for resistance to *Septoria lycopersici* [cf. ibid., xxvii, pp. 49, 120] and *Alternaria* [*solani*] and for other qualities. The optimum temperatures for sporulation, germination, and growth of *S. lycopersici* were all near 20° C. Sporulation was most critically limited by unfavourable temperature, and was abundant only at 20° and 25°; abundant infection occurred at 14·6° to 26·1°, but lesion development was more rapid at the higher temperatures.

Report of the Federal Experiment Station in Puerto Rico, 1947.—85 pp., 1948.

In the section (pp. 45–51) of this report [cf. *R.A.M.*, xxvii, p. 255] dealing with physiological studies by A. J. Loustalot, E. A. Telford, and C. F. Cernuda an experiment is described in which kudzu (*Pueraria phaseoloides*) plants were grown in sand cultures and nutrient solutions deficient in certain elements. The resulting mineral deficiency symptoms are described and discussed. In some parts of Puerto Rico, tropical kudzu does not grow vigorously, and many leaves, which show an interveinal chlorosis becoming more marked with age, have a potassium-calcium ratio less than unity.

In experiments by H. R. Cíbes and N. F. Childers (pp. 66–71) vanilla (*V. fragrans*) plants growing under a lath shade of bamboo admitting one-half or one-third the normal amount of sunlight and mulched with Catalina clay and Toa silty clay loam showed severe wilting or drying, possibly caused by *Fusarium bataticola* var. *vanillae* [ibid., xxvii, p. 464] whereas those mulched with Soller clay did not. Most of the affected vines were in a part of the beds where drainage was slow. Under present lath-house conditions, mildew (*Phytophthora* sp.) [cf. ibid., xvi, p. 161] was observed on several pods and vines; the disease is aggravated by high humidity and insufficient air circulation during the rainy season.

Magrou (J.), Manigault (P.), & Sevrétain (G.). **Immunité et allergie chez les végétaux.** [Immunity and allergy in plants.]—*Ann. Inst. Pasteur*, lxxv, 3, pp. 283–285, 1 pl., 1948.

Proof has been obtained of the hypersensitivity of *Pelargonium* [*zonale*] plants already suffering from crown gall [see next abstract] to re-inoculation with the causal

organism, *Agrobacterium* [*Bacterium*] *tumefaciens*. On 10th May, 1948, a plant with an outgrowth produced by inoculation at the beginning of March was re-inoculated on 10th May through all the internodes above and below the tumour. Two days later long, deep, lozenge-shaped cracks appeared in the internodes closest to and farthest away from the tumour. At the same time, in the intermediate zone comparable but much more extensive fissures had coalesced from one internode to the next, thereby producing a kind of total rupture of the stem. Thus, the 'zonal' phenomenon, already described in connexion with immunity [*R.A.M.*, xvi, p. 799], has again been observed in cases of hypersensitivity. Similar results were obtained in another plant inoculated only above the tumour. On 1st July, incipient tumours were arising from the fissures nearest to and farthest away from the original excrescence in both plants. In other experiments the same course was followed on branches proceeding from the inoculated stem. It would appear from these results that immunity and hypersensitivity (or allergy) are merely two different aspects of the same process.

Ryбak (B.). **Infections associées expérimentales du Pelargonium.** [Associated experimental infections of the *Pelargonium*.]—*Ann. Inst. Pasteur*, lxxv, 3, pp. 285–290, 4 figs., 1948.

Experiments were performed to determine the reaction of ten-month-old *Pelargonium zonale* plants to inoculation with two bacteria, not mutually antagonistic but producing diametrically opposite effects on their hosts, i.e., the agents of crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*) and wet rot (*Erwinia carotovora*). After two months tumours with dry partial necroses developed on the plants inoculated with the bacterial complex, while the controls inoculated with each organism separately developed, in the case of *Bact. tumefaciens*, the normal, cauliflower-shaped outgrowths without necrosis typical of crown gall, and in that of *E. carotovora* merely local reactions round the site of inoculation. The negative results in the latter instance were due to insufficient moisture in the air, and a further series of experiments was conducted in a water-saturated atmosphere with the following results. A small proportion of the plants inoculated with the mixed cultures developed a severe wet rot with almost total rupture of the stem, but most of the infections were mild, consisting merely in humid, fusiform necroses and extensive fissures in the thickness of the stem. The *E. carotovora* controls also contracted humid necroses of variable extent, while most of those inoculated with *Bact. tumefaciens* alone developed ruptures involving only the epidermis. When the plants inoculated with the complex were transferred to an atmosphere of moderate humidity normal crown gall tumours developed in a month, indicating that the culture of *Bact. tumefaciens* was modified neither by *E. carotovora* itself nor by the secretions of the necrotic tissues infected by the latter.

Braun (A. C.). **Studies on the origin and development of plant teratomas incited by the crown-gall bacterium.**—*Amer. J. Bot.*, xxxv, 8, pp. 511–519, 11 figs., 1948.

In these studies at the Rockefeller Institute, Princeton, New Jersey, when the T37 walnut strain of the crown gall organism [*Bacterium tumefaciens*: *R.A.M.*, xxvii, p. 556] was inoculated into *Kalanchoe daigremontiana* plants at different points along the stem, typical undifferentiated tumours similar to those found on many other hosts were produced. As they enlarged the tumours in the younger parts of the stem produced leaves and stems showing varying degrees of morphological differentiation and distortion. The results of several experiments, although not entirely conclusive, suggested that the morphologically complex structures found in the teratomas were the result of the growth of tumour cells that had recovered in varying degrees from the effects of the tumour-inducing principle.

It may be that the type and competence of the cells affected and the reactivity of the tissues in which the cells are embedded are of fundamental importance in determining the type of structure that ultimately develops. If the assumption that there are factors present in plant cells that determine their morphogenetic fate is correct, it is interesting to note that the potentiality for differentiation in certain young cells appears to be so great that complete recovery takes place and apparently normal plants are produced.

Morel (G.) & Gautheret (R.). **Pathologie végétale et culture des tissus.**—[Plant pathology and tissue culture.]—*Rev. sci., Paris*, lxxxv, 3276, pp. 649–669, 14 figs., 5 diags., 3 graphs, 1947.

This is a survey and discussion of the literature on the use of tissue culture in plant pathology, with special reference to the great advances made by this method in the study of such diseases as crown gall (*Phytomonas* [*Bacterium*] *tumefaciens*), tobacco mosaic virus, and vine downy mildew [*Plasmopara viticola*]. An approach has also been made to the investigation of the immunity problem by means of this procedure. Many of the papers listed in the bibliography of 57 titles have been noticed in this *Review*.

Voelcker (O. J.). **West African Cacao Research Institute: field experiments.**—*Emp. J. exp. Agric.*, xvi, 64, pp. 241–248, 1 pl., 1 map, 1948.

In this paper outlining the development of the West African Cacao Research Institute and describing the research programme in connexion with field experiments to control cacao swollen shoot [*R.A.M.*, xxvii, p. 515; and above, p. 115] it is stated that at the old station the present intention is to remove dead wood and mistletoe annually and to practise selective weeding to encourage volunteer forest-tree seedlings, regular harvesting, and the removal of dead pods, to fill gaps caused by vacancies with banana, *Gliricidia*, and tree cassava to provide shade on replanting, and to 'paint' young cacao trees with DDT emulsion to control the capsid *Distantiella theobroma*. The beneficial effect of roguing and the use of DDT emulsion is already apparent on young plants at the Adonkwanta and Kukua sub-stations, disease incidence being less than 0·03 per cent. on the treated plots in marked contrast to the surrounding devastated farms on which no control is practised. It is proposed to use the new area of experimental land acquired in 1944 for introduced varieties of cacao, progeny trials, and multiplication of improved types, while future research on tolerant cacao varieties, immunization, rate of spread, and the effect of mild strains of swollen shoot on yield is envisaged.

Kišpatić (J.). **Sorosporium reilianum McAlp. Jedna nova snijet Kukuruza kod nas.** [*Sorosporium reilianum* McAlp. A new smut of Maize in our country.] —*Ann. Trav. agric. Sci., Belgrade*, iii, 5, pp. 90–101, 3 pl., 1948. [English summary.]

Sorosporium reilianum [*Sphacelotheca reiliana*: *R.A.M.*, xxiv, p. 128; xxvii, p. 116] was first observed in Yugoslavia on maize in 1939 at Vojvodina, in the northern part of the country. Later it was found near Zagreb and at Samobor. In 1946 it was reported from Sarajevo, and in 1947 again from the neighbourhood of Zagreb and Konjica. The disease is often mistaken for *Ustilago maydis* and, therefore, is probably present in many more districts, representing a potential threat to the maize crops. It is suggested that the spores of the fungus either came from Hungary, or arrived with (UNRRA) seed from the United States [ibid., xxi, p. 205]. The geographical distribution, biology, host range, and specialization of the fungus are described. The control measures include seed treatment [ibid., xii, p. 563] and hygienic cultural methods.

Larose (E.), Jacques (A.), & Lounsky (J.). **La lutte contre le charbon nu des céréales (Ustilago nuda Jensen et Ustilago nuda tritici Schaf.) par la désinfection des semences à l'eau chaude. Application industrielle du traitement.** [The control of cereal loose smut (*Ustilago nuda* Jensen and *U. nuda tritici* Schaf.) by seed disinfection with hot water. Industrial application of the treatment.] —*Bull. Inst. agron. Gembloux*, xv, 1–4, pp. 3–18, 5 figs., 1946. [Flemish, German, and English summaries. Received November, 1948.]

An account is given of large-scale tests carried out at Gembloux, Belgium, on the hot-water treatment of barley seed against *Ustilago nuda* [*R.A.M.*, xxv, p. 63] and of wheat against *U. nuda tritici* [*U. tritici*: ibid., xxv, p. 30]. In the preliminary laboratory tests barley was submitted to 50 minutes' pre-soaking at 45° C. with a soluble mercury fungicide added to control *U. hordei* and *Helminthosporium gramineum*. The seed was then immersed in water at 52° for ten minutes, counting from the time that the middle of the mass of seed reached this temperature. It was then quickly restored to normal temperature by cold water.

The wheat seed was pre-soaked for two hours at 30° and then treated at 52° for 20 minutes, the pre-soak also containing a soluble fungicide for the control of *Tilletia tritici* [*T. caries*]. Immediately after cooling, the seed was spread out on a fine gauze and heated in a kiln to 45° for the barley and 30° for the wheat until the moisture content was normal (±14 per cent.). The germination of the treated seed was not reduced, or only very slightly so, though it was somewhat retarded, in some cases by three or four days.

The large-scale tests were begun in 1945–6, when 14 tons of winter barley seed were treated in August and September, and five tons of spring wheat seed in January and February. In 1946–7, 26 tons of barley and two of spring wheat and in 1947–8, 16 and 5 tons, respectively, were treated. The three years' work showed that if the second treatment was made at 52·2° instead of 52° the viability of the seed was not reduced and disinfection was more complete. All the operations were carried out in unbroken succession as follows. Each lot of barley seed was pre-soaked for 50 minutes at 46°, then treated at 52·2° for ten minutes (counting from the time when the seed, vigorously stirred, had reached this temperature), quickly plunged into cold water kept moving by compressed air, and, when cooled to normal temperature, kiln-dried. The wheat seed was treated in the same way, the pre-soak being at 30° for two hours and the main treatment at 52° for 20 minutes. In the first year the barley was dried at 45° to 50° for 24 hours, during which the seed was turned over at least four times; later, the temperature used was 35° to 40°. The wheat seed was dried at 30° to 35°. The work was carried out by seven men, working under supervision. Observations indicated that the drying temperature had as much effect on germinative ability and vigour of germination as had the treatment itself. Barley seed dried at 35° to 40° showed no reduction of germinative ability and very little in vigour, being distinctly superior to seed dried at 45° to 50°. On the other hand, germinative ability rapidly and markedly declined if, during the 24 hours, the water content of the seed did not return to normal. It was also found that seed collected when quite ripe and placed in completely dry conditions could be successfully treated. Seed subjected to humidity during harvesting is dangerous to disinfect even if its germinative ability seems normal. Barley seed of the 1947 crop after the large-scale treatment retained a germinative vigour of about 98 per cent., which was equal to that of untreated seed, but germination was delayed for two or three days. When planted nearer the surface and in greater quantity than untreated seed, the treated seed, however, gave normal populations.

Wheat seed submitted to the large-scale treatment showed up to four days delay in germination in the field. Disinfection appeared practically complete by both methods. In multiplication plots grown from the treated seeds a very few smutted

plants (under 10 per are) were occasionally seen, but in most of the fields no infection was present.

Reinfection was observed in 1947 in plants grown from seed taken from disease-free plants in 1946 grown from treated seed. Winter barley showed mostly from 25 to 50 smutted plants per are, and spring wheat 8 or 9 per are.

The authors consider that, for barley especially, so long as smut-resistant varieties are not available this form of treatment should be carried out every year when the plants are to be used for seed-production. It is essential that the treated seed should be planted in a special area entirely reserved for it. As carried out under the experimental conditions, this large-scale treatment was found to be laborious and to demand much skill. Only agricultural stations with an expert staff would be competent to carry it out.

Semeniuk (G.). **Root rot in your Corn.**—*Iowa Farm Sci.*, iii, 2, pp. 6–7, 4 figs., 1948.

Root rot of maize, due to *Pythium graminicola* [*R.A.M.*, xxvi, p. 391] and other soil-inhabiting parasites, causes considerable yield reductions in Iowa each year. The author recommends the breeding of resistant varieties, development of hybrids with more abundant root systems, crop rotation with soy-beans, oats, and legumes, and the use of fertilizers which help the plants to withstand root rot damage.

Wager (V. A.). **The distribution of the black spot fungus in South Africa.**—*Citrus Grower, 1948*, 174, p. 4, 1 fig., 1948.

The destructive black spot disease [*Phoma citricarpa*: *R.A.M.*, xxvii, p. 563] occurs in most of the citrus-growing areas of Natal, in the Barberton and Nelspruit areas of the eastern Transvaal, at Letaba, Tzaneen, and Duivelskloof in the northern, and on one farm in the western Transvaal.

As a result of Kiely's findings [ibid., xxvii, p. 562] the author examined over 300 samples of green and dead leaves from nearly all the citrus areas in which the disease has not, as yet, been recorded. The results showed that the fungus is present in almost every citrus-growing area of the eastern and north-eastern Transvaal, in a few areas in the northern and central Transvaal, and on three farms in the Rustenburg district. It has also been found in the eastern Cape near Port Elizabeth, the Sundays River Valley, the Gamtoos River Valley, the Grahamstown area, the Keiskama Valley, and the Kat River Valley. The western Cape has not yet been investigated.

It is suggested that climatic conditions are probably responsible for inducing the latent fungus to become visible. In the Transvaal the disease became visible only three or four years ago, though the fungus might have been present there for much longer. In view of the wide distribution of the latent fungus there is danger of future visible outbreaks. For the time being the disease can be controlled only when it becomes active by spraying with Bordeaux mixture.

The spots usually appear on fruits in warm spring weather. Navel oranges, which ripen in mid-winter, are therefore less likely to become affected than the spring-ripening Valencias.

Nadel-Schiffmann (Mina). **Phytophthora hibernalis.**—*Palest. J. Bot.*, R. Ser., vi, 1–2, pp. 148–157, 5 figs., 1 graph, 1947.

In January, 1945, *Phytophthora hibernalis* [cf. *R.A.M.*, xx, p. 571; xxvi, p. 216] was isolated by the author from lemon fruits in Palestine, and in 1947 from Shamouti orange fruits. The isolates differed from *P. hibernalis* as previously described in that chlamydospores sometimes developed on potato agar and very

often on mycelium from this medium put into distilled water. They also appeared on the aerial mycelium on oatmeal agar, and in reisolations on potato dextrose agar from inoculated lemon fruits. The chlamydospores from all media measured 15 to 25·5 (average 20·4) μ in diameter, and were arranged in chains. Fungal growth occurred between 3° and 23° C., with an optimum between 18° and 21°. Good growth was obtained on all solid media, growth being slightly more rapid on maize-meal and oatmeal agars than on potato dextrose and Leonian's agars. On potato agar the mycelial growth markedly resembled that of *P. citrophthora*. Oogonia or sporangia did not form and often only chlamydospores developed. On oatmeal agar the low, aerial mycelium was white to greyish, oogonia developed in 10 to 14 days and were particularly numerous at 3° and 5°, while only chlamydospores were present on the aerial mycelium. On maize-meal agar the slight, thin, white, aerial mycelium was apparent for only 10 to 14 days. Oogonia occurred at all temperatures, but only chlamydospores were present on the aerial mycelium. On Leonian's synthetic agar the mycelium grew only in the agar and consisted of thin, radiating threads. Within the agar, numerous sporangia developed at all temperatures. In Leonian's nutrient solution growth was very slow, no fructifications being seen during two months' observations.

Pathogenicity studies showed that the fungus isolated from lemon fruits caused rotting of lemon, Shamouti and Valencia oranges, and grapefruit. It was highly pathogenic to apples and 100 per cent. infection of eggplant and tomato fruits stored at 10° for 10 to 12 days was obtained. It was also pathogenic to potato tubers, dormant tubers apparently taking infection more readily than those ready to sprout.

Following Leonian, the author grew the fungus on bacto-dextrose broth with the addition of 0·25 per cent. anhydrous potassium carbonate, and in agreement with his results [ibid., xiv, p. 398] found that it developed on this medium, though growth was slower than on agar media. No growth took place in nutrient solution with the addition of malachite green [loc. cit.] at 1:4,000,000 but slight sporadic growth occurred in a 1:10,000,000 solution after three weeks. These results confirm the view that the fungus studied is *P. hibernalis*.

Jenkins (Anna E.). **The Swingle Sphaceloma hand lens and early records of the pathogen of Citrus scab.**—*Mycologia*, xl, 5, pp. 630–632, 1 fig., 1948.

During the first scientific investigations into citrus diseases in California in 1892, W. T. Swingle used a powerful hand lens (×40) for estimating the effectiveness of his experimental spraying for the control of scab [*Sphaceloma fawcettii* var. *viscosa*: *R.A.M.*, xv, p. 574]. Swingle's early drawings, here reproduced, and specimen of the fungus, as well as a knowledge of the existence of his hand lens, are essential to a satisfactory reconstruction of the taxonomic history of the pathogen.

Kessler (K. L.) & Allison (J. R.). **Use of growth regulators on Lemons in storage.** —*Calif. Citrogr.*, xxxiv, 1, pp. 24–25, 28, 1 fig., 1948.

This report from the Leffingwell Company, California, on the progress made since January, 1948, with tests to determine the efficiency of 44 per cent. 2,4-D for preserving lemons in storage should not be considered conclusive but is given to encourage further research on these lines. The outstanding feature of all the experiments has been the considerable reduction of *Alternaria* infection [*A. citri*: *R.A.M.*, xxv, p. 393] that has resulted. In the third, most recent experiment, untreated silver and ripe fruits developed about 9 per cent. decay, 60 to 75 per cent. black buttons, and 20 to 22 per cent. internal decline or *A. citri* infection, while those treated before storage with 2,4-D at 200 to 1,000 p.p.m. showed no decay, all

buttons remained intact and green, and no *Alternaria* was present after more than four months' storage.

Batista (A. C.). **Catacauma torrendiella n. sp., agente da verrugose do Coqueiro.** [*Catacauma torrendiella* n. sp., agent of Coco-nut wart disease.]—*Bol. Agric., Pernambuco*, xv, 2, pp. 129–133, 9 figs., 1948.

In 1945 a disease involving the leaves, rachides, peduncles, and fruits of coco-nut palms, including those of the dwarf type, was observed for the first time in Bahia, Brazil. The affected leaves are covered with wart-like crusts, 780 to 1,320 μ in diameter and 500 to 800 μ in height, originating as small, black, carbonaceous intumescences, which expand and converge to produce extensive necrosis, while the surrounding area acquires a yellow tinge. On the other organs the discoloration is less conspicuous and the intumescences follow the secondary veins, forming rectangular necroses 15 by 2 cm. As the decay progresses, the leaves turn yellow and shrivel; when dead, they remain clinging to the stem. A severe attack of the disease, causing the death of many leaves within a few months, may mean the total loss of the crop. The lesions on the rachides, peduncles, and nuts tend to induce gummosis, leading to the premature death of the foliage and dropping of the nuts. The pathogen is controllable by spraying the palms with 1 per cent. Bordeaux mixture.

The causal fungus is named *Catacauma torrendiella* n.sp. It invades the epidermal and subjacent tissues which are disorganized by the developing stromata. The fuscous, septate hyphae, 2·8 to 4·2 μ in diameter, emanating from the stromata in the upper portion of the palisade tissue, may penetrate right into the latter, and subsequently the necrosis extends to the neighbouring tissues. Below the compact, carbonaceous or brittle clypeus, 60 to 80 μ in diameter, is a globose-depressed or sometimes ellipsoid locule (rarely two), 221 to 442 by 195 to 390 μ. The cylindrical-clavate asci, 75 to 115 by 17·5 to 27·5 μ, are furnished with a pedicel averaging 30 μ in length and contain eight hyaline, oblong-ovoid, sometimes fusoid or irregular ascospores, 15 to 22·5 by 7·5 to 10 μ. Numerous filiform, septate, branched paraphyses of variable diameter are present.

Wardlaw (C. W.). **Vascular wilt disease of Oil Palm in Nigeria.**—*Nature, Lond.*, clxii, 4126, pp. 850–851, 1948.

During 1948, in an inspection of oil palm plantations in Nigeria, the author obtained confirmation of the presence of vascular wilt disease, associated with *Fusarium oxysporum* [*R.A.M.*, xxvii, p. 523]. Many trees eight to twelve years old had been killed, together with the younger replacements. Infected vascular strands were found in seedlings 18 to 24 months old, from which *F. oxysporum* and other *F.* species were isolated. This information may materially help to shorten the programme of breeding resistant varieties.

In Nigeria patch yellow [ibid., xxvi, pp. 103, 487] is also associated with a strain of *F. oxysporum* which, however, differs from that isolated from the necrosed vascular strands. These observations show that, broadly speaking, the chief plantation problems are common to the whole oil palm region of West and Central Africa.

Daji (J. A.). **Manganese toxicity as a probable cause of the band disease of Areca Palm.**—*Curr. Sci.*, xvii, 9, pp. 259–260, 1948.

The 'band' disease of areca palms in the Ratnagiri and Kolaba districts of Bombay Province is characterized by the shortening and thickening of the leaves and leaflets, which acquire a dark green colour and feel leathery to the touch. The internodes are shorter as the palm ages and the stem becomes constricted at the top. The palm ceases to bear and the crown dwindles, ultimately shrivelling and

falling off. During the last 50 years the problem has been investigated several times without disclosing any pathogenic agency, and the disease has accordingly been attributed to nutritional factors associated with soil infertility.

In the course of pH determinations by the quinhydrone method of soil from affected gardens some of the samples showed a considerable drift in the potential, suggesting the presence of manganese oxides. Comparative analyses of samples from the affected area and two other localities revealed a much higher content of total and available manganese in the first-named. A particularly striking feature was the presence of large quantities of the mineral in an available form in the upper layers of the soil near the diseased palms. The leaves of palms in affected gardens contained much more iron, as well as manganese, than those in localities free from 'band' disease. The toxicity induced by the abnormally high absorption of those elements is believed to be the cause of the disorder.

Smith (A. L.). **Soil fumigation for the control of Cotton wilt and nematodes.**—*Down to Earth*, iv, 3, pp. 12–13, 8 figs., 1948.

The results of these experiments at Plains, Georgia, and Tallassee, Alabama, have already been noted from another source [*R.A.M.*, xxviii, p. 15].

Mains (E. B.). **Entomogenous fungi.**—*Mycologia*, xl, 4, pp. 402–416, 4 figs., 1948.

Continuing his studies on entomogenous fungi [cf. *R.A.M.*, xxvii, p. 235], the author gives technical notes on the taxonomy of *Cordyceps puiggarii*, *C. subsessilis*, *C. peltata* on *Cryptorrhynchus corticalis*, *Stilbum burmense* n.sp., *S. ramosum* (for which the name *Polycephalomyces ramosus* n. comb. is proposed), and *P. paludosus* n.sp.

Petch (T.). **A revised list of British entomogenous fungi.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 286–304, 1948.

This annotated list of entomogenous fungi occurring in Great Britain includes 42 additions to the author's previous list [*R.A.M.*, xii, p. 216] as well as one new species. An epidemic of *Entomophthora sphaerosperma* [ibid., xxii, p. 431] on caterpillars of *Pieris brassicae* on a field of *Brassica* sp. in Kent was reported by S. G. Jary in September, 1945. Many of the caterpillars were killed. The rarity of epidemics of this fungus on *Pieris* larvae in Great Britain in spite of its frequent occurrence on other hosts, and the different effects it produces on the latter suggest that more than one fungus is included under the name.

What appeared to be *Tarichium megaspermum* [ibid., v, p. 228] was collected by S. G. Jary in larvae of *Plusia gamma* on pea plants on Romney Marsh, Kent, in July, 1946. The spores are spherical or slightly ellipsoid, black or black-brown, 36 to 50 μ in diameter, at first loosely contained, singly or in pairs, in a pale brown, thin-walled, smooth mother cell, which is ellipsoid or prolonged at one end into a cylindrical or conico-cylindrical appendage. They soon become free, and numerous empty mother cells occur among the black spores. The external black material appears to be a deposit, not a spore wall. Beneath is a thin, brown, smooth epispore and a hyaline inner wall 3 μ thick. The mother cells are evidently produced terminally or laterally on hyphae as figured by Cohn (1875), but the cell wall was not furrowed and the wall of the spore beneath the black deposit was smooth. The specimens examined suggest that the fungus belongs to the Chytridiales. Specimens matching those from Romney were also received from Kenya.

Hirsutella saussurei [ibid., iii, pp. 212, 399; iv, p. 167; xi, p. 179] was found on several occasions by E. A. Ellis on Ichneumonidae and small Hymenoptera near Norwich during May to October, 1945. The clavae were short, but on one specimen were up to 15 mm. long. In four collections the conidia were cymbiform or narrow-oval, and measured 6 to 9 by 2 to 2·5 μ.

Owen (W. L.) & Mobley (R. L.). **A new species of Torula occurring in and transmitted by the American Cockroach Periplaneta americana (Linn.)**—*Food Res.*, xiii, 4, pp. 281–290, 2 figs., 1948.

Torula acidophila n.sp. is the name applied [without a Latin diagnosis] to an organism encountered as a contaminant in a syrup product in a Louisiana factory and found to originate in the intestinal tract of the American cockroach (*Periplaneta americana*). The fungus [which is described] imparts a characteristic flavour, suggestive of malic acid, to the syrup in which it occurs.

McLaren (Barbara A.), Herman (E. F.), Elvehjem (C. A.), & Schneberger (E.). **The use of phemerol in the treatment of certain bacterial Fish diseases.**—*Trans. Wis. Acad. Sci. Arts Lett.*, xxxvii (*1945*), pp. 265–274, 4 figs., 1947. [Received January, 1949.]

When the disinfectant phemerol, a quarternary ammonium salt, was used at 1:10,000 as a 30-second dip for curing fin rot of rainbow trout (*Salmo gairdnerii irideus*), caused by an unidentified bacterium, at the James Neven State Fish Hatchery, Madison, Wisconsin, it was found that secondary [unspecified] fungous infections were also destroyed by this treatment.

Newby (H. V.). **Observations on Saprolegniaceae. II. Saprolegnia paradoxa Maurizio.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 266–270, 6 figs., 1948.

Observations made upon single-spore cultures of *Saprolegnia paradoxa* are described. The fungus was isolated from a dead roach at Haslemere, Surrey. Its morphology agreed well with Maurizio's description (*Z. Fisch.*, vii, 2, pp. 1–66, 1899), and in the later stages of fruiting produced the anomalous egg-containing structures which resemble antheridia or androgynous antheridial branches.

Hagen (A.). **Nelliksot funnet i Norge.** [Carnation smut found in Norway.]—Reprinted from *Gartneryrket, 1948*, 45, 1 p., 1948.

Several collections of smut (*Ustilago violacea*) have been made of recent years on both in- and outdoor carnations [*R.A.M.*, xviii, p. 783] in eastern Norway, this being the first record of the parasite on cultivated *Dianthus* in the country. In one of the outdoor habitats *D. deltoides* was also attacked. Napoleon III, a cross between *D. barbatus* and either *D. caryophyllus* or *D. carthusianorum*, was one of the varieties affected.

Welsh (M. F.). **Stunt-mottle virus disease of Chrysanthemum.**—*Sci. Agric.*, xxviii, 9, p. 422, 2 pl., 1948.

In the autumn of 1945, three of the several *Chrysanthemum morifolium* varieties grown in a greenhouse at the Dominion Experimental Station, Summerland, British Columbia, were affected by a virus disease. The same symptoms have since been found in Mrs. Agnes Holden, Appert, Betsey Ross, Corinthia, Crimson Pockett, Joseph Bradford, Mrs. Hadgood, Mrs. Leslie Davis, Mrs. T. W. Pockett, Peace, and Yellow Turner. The plants are dwarfed and the leaves show mottling bordering the veins, which may become a distinct vein-clearing. The leaves of some varieties are also dwarfed and distorted. Seven varieties produced dwarfed and ragged blooms. The name 'stunt-mottle' has been suggested.

The disease was transmitted readily by grafting. When the symptomless varieties Louisa Pockett and Yellow Favourite were grafted to infected Mrs. T. W. Pockett and Appert, there was no transfer of symptoms. Other symptomless varieties include Anne Baxter, Connie Mayhew, Edith Cavell, Mrs. E. R. Russland, White Favourite, and Yellow Pockett.

Dimock (A. W.). **Parzate.**—*Bull. N.Y. St. Flower Grs*, xxxi, p. 8, 1948. [Abs. in *Chem. Abstr.*, xlii, 10, pp. 3519–3520, 1948.]

The active ingredient of parzate, a white powder mixing readily with water and apparently having excellent spreading qualities, is zinc ethylene bisdithiocarbamate [*R.A.M.*, xxvi, p. 472 *et passim*]. In extensive trials in New York State it has proved outstanding in the control of snapdragon [*Antirrhinum majus*] rust [*Puccinia antirrhini*] at the rate of 2 lb. in 100 gals. water plus Du Pont spreader-sticker [ibid., xxvi, p. 331] at 1 in 1,000. Parzate was also highly effective against anthracnose of the same host [*Colletotrichum antirrhini*] and chrysanthemum leaf spot (*Septoria*) [*chrysanthemi*], though fermate is primarily recommended for the control of the latter. Parzate gives equally good results without a spreader, which helps, however, to conceal the somewhat conspicuous deposit.

Garg (D. N.). **Pellicularia filamentosa (Pat.) Rogers, comb. nov. causing a root-rot of Berseem (Trifolium alexandrinum Linn.) in the United Provinces.**—*Curr. Sci.*, xvii, 9, p. 270, 1948.

Pellicularia filamentosa (*Corticium solani*) [*R.A.M.*, xxii, p. 272] was observed in April, 1948, to be causing a destructive root rot of clover (*Trifolium alexandrinum*) at and near the Government Agricultural Farm, Bareilly, United Provinces, a first record of the fungus on this host for the region. The seed, if any, procured from the severely diseased plants was shrivelled owing to the premature desiccation of the crop, which was accelerated by the prevailing easterly winds. Infection generally began when the plants were 5 to 12 in. in height and was at first located in the roots and crown, which gradually turned black. By this time the leaves and branches had begun to wither, and later the bark of the crown dried up, the taproot rotted, and secondary root development was restricted. At an advanced stage of the disease sclerotia were produced on and near the crown; they remain viable in the soil for four or five years, so that crop rotation offers the only prospect of combating the pathogen.

Dovaston (H. F.). **A new species of Pyrenophora from Italian Ryegrass.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 249–253, 1 pl., 7 figs., 1948.

The first British record of leaf spot on rye grass [*Lolium perenne* and *L. multiflorum*], due to *Helminthosporium siccans* [*R.A.M.*, xx, p. 22], was published in 1940, though the disease had been known at Aberystwyth since 1922. Material was also collected in Scotland by Dennis in 1932 [ibid., xxi, p. 439]. The disease is relatively common in Scotland and occurs on wild populations of *L. perenne* remote from cultivation. The types of lesion so far reported are: from Germany (1903), net lesions (apparently); from the United States (1923), spot lesions only [cf. ibid., iii, p. 65]; from Wales (1940), spot lesions only; and from Scotland (1942), both net and spot lesions. There can be no doubt that in Scotland both spot and net lesions are present on both species of rye grass, but in general net lesions are most clearly developed on *L. multiflorum*.

During the past two years the author has made numerous monospore cultures from a range of lesion types on cultivated Italian and perennial rye grass at Auchincruive, Scotland. The cultural characters of the fungus resembled those described by Sampson and Western in 1940. The aerial mycelium was light grey, there was an olive-green plectenchyma, and spore production was abundant after three weeks. In some isolates few sclerotia were present, but occasionally they were numerous and large. Generally, when sclerotia were abundant, development of aerial mycelium and *Helminthosporium* spores was correspondingly sparse. The sclerotia were filled with an oily filamentous tissue of vertical orientation but indefinite structure, and bore flexuous tapering setae externally. One culture on

oatmeal agar gave ripe asci and spores, which showed that the sclerotia were immature perithecia. These cultures, made in September, 1946, were kept outdoors, and the very cold winter that followed may have favoured the production of asci and spores.

The fungus, which is named *Pyrenophora lolii* n.sp., is characterized by irregular perithecia, 300 to 1,000 μ in diameter (average 710 by 550 μ), with a short conical beak when mature; externally 1 to 50 flexuous, tapering, multicellular setae may be present, 8 to 11 μ in diameter at the base and up to 200 μ long. The 8-spored asci measure 172 to 230 by 27 to 41 μ; they are broadly cylindrical when mature, and the apex is truncate and has a thickened apical ring; the stipe is longer than in *P. avenae* and *P. teres*. The pale brown spores measure 49 to 67 by 16 to 22 μ and when mature nearly always show five transverse and 0 to 4 (usually 2) longitudinal septa. The spores are frequently abortive, and most asci have two to six normal spores. Germination is prompt, with one to five (mostly two) lateral or polar germ-tubes. The species is distinguished from *P. teres* by its 5-septate spores and from *P. avenae* by the elongated perithecium, broader setae, smaller asci, and more narrowly ellipsoidal ascospores.

The morphological features of conidiophores and spores often developing on the upper surface of the perithecia correspond with those of *H. siccans*.

The fungus was still pathogenic to Italian rye grass after four months in culture, producing indefinite net lesions four to five days after inoculation. Some evidence was obtained of pathogenicity to oats.

Ingold (C. T.). **The water-relations of spore discharge in Epichloe.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 277–280, 1 fig., 1 graph, 1948.

Experiments, conducted to ascertain whether *Epichloe typhina* [*R.A.M.*, xxii, p. 210; xxiii, p. 151] (on *Dactylis glomerata*) obtains water during its periods of active spore discharge from the host cells and, therefore, indirectly from the transpiration stream of the grass, or whether spore discharge is confined to damp periods when the stroma is wetted by rain or dew, are described. The evidence obtained showed that discharge tended to be periodic, with a minimum rate in the morning and a maximum in the late afternoon or evening, a single stroma discharging 2,000 to 10,000 spores per minute. When the air was moderately dry, discharge persisted for several days provided the water supply to the host was maintained; when, however, the transpiration stream was stopped by severing the stem, discharge ceased.

Louw (A. J.). **Investigations on the cracking of Ohenimuri Apples.** —*Fmg S. Afr.*, xxiii, 270, pp. 596–602, 2 figs., 1948.

Ohenimuri apples, the most commonly cultivated variety in the western Cape Province, are particularly subject to the cracking disorder [*R.A.M.*, xviii, p. 784] characterized by a russeting round the stem end and the development there of deep cracks which sometimes appear on the cheek of the fruit.

Various researches conducted in this Province since 1940 have revealed no fungus that is directly responsible for the condition. Microscopic examination further revealed that the hypodermal cells in severely russeted, cracked fruit were suberized and mostly dead, and became increasingly elongated and flattened as the fruit swelled out. This cell condition was not apparent in non-cracked fruits even when fairly severely russeted at the same stage of development.

Spraying with lime-sulphur, wetsul, and verderame from 1940 to 1948 brought about no decrease in the cracking of the fruit, supporting the view that the condition is not of fungous origin.

The discovery that cracking occurs in fruits having a low seed content, and from trees bearing a light crop, and that the majority of cracked and severely

russeted fruits are found on outer and weak branches of the tree, supported the view that the condition is due to a functional disturbance in the tree or fruit itself.

Enclosing apples in paper bags reduced cracking from 63 to 32 per cent. The shade provided by luxuriant growth after severe pruning also reduced cracking. The reduction was not so marked in trees from which only the fruit spurs had been removed. In similar experiments where little increased growth resulted from pruning the effect on fruit cracking was negligible.

The structural changes which occur in the hypodermal cells before cracking and the limiting effect of shading on cracking indicate that the condition may be associated with excessive water loss from the outer tissues. This causes premature cork formation in the hypodermal cells which results in the cracking of the outer tissues due to lack of elasticity as the fruit expands. This contention is supported by the fact that on trees of equal vigour cracking occurs more severely in the drier inland regions, where the water loss is very high in the summer months, than in the humid regions near the coast. Where a dry atmosphere is the main source of cracking, this can be remedied by practising overhead irrigation or planting summer cover crops. It may be necessary to replace the Ohenimuri variety with others more suited to the local climatic conditions.

McKay (R.). **Perithecial development of Venturia inaequalis on scabbed Apples.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, p. 285, 1948.

Annie Elizabeth apples, which were so badly attacked by scab [*Venturia inaequalis*] in an orchard near Dublin that they were never picked, fell to the ground in January, 1947, and remained under snow throughout February and part of March. On 25th March, 1947, they were found to bear a fairly abundant development of the perithecia of the fungus, apparently the first record of these organs on scabbed fruit.

Cooley (J. S.). **Collar injury of Apple trees associated with waterlogged soil.**—*Phytopathology*, xxxviii, 9, pp. 736–739, 1 fig., 1948.

Five-year-old apple trees growing on heavy soil at the Plant Industry Station, Beltsville, Maryland, developed extensive collar injury during the wet summer of 1945. Winter injury, a common cause of the trouble, was apparently excluded as a contributory factor in the present case, while inoculations with *Phytophthora cactorum*, a frequent agent of collar damage, resulted only in non-progressive lesions up to 10 mm. in diameter on 10 per cent. of the trees. The condition is attributed to waterlogging of the soil, to which there are few references in this connexion in the relevant literature.

Barbier (G.). **Guérison, au moins partielle, d'une maladie des Pommiers du Palatinat par application de zinc.** [The partial cure of a disease of Apple trees in the Palatinate by zinc applications.]—*C. R. Acad. Agric. Fr.*, xxxiv, 12, pp. 786–787, 1948.

A disease of apple trees, which has been known for several years in an orchard on sandy, permeable soil at the Centre de Recherches Agronomiques, Limburgerhof, Germany, and which was diagnosed as due to zinc deficiency [*R.A.M.*, xxvii, p. 424] had, by June, 1948, greatly improved after spraying with a zinc sulphate solution the previous February.

McKnight (T.). **Crinkle virus disease of Strawberry.**—*Qd agric. J.*, lxvii, 2, pp. 102–104, 2 figs., 1948.

In 1947 strawberry growers in the main production areas of Queensland suffered serious losses from crinkle [*R.A.M.*, xix, p. 460]. All commercial plantings

inspected were affected in varying degrees, the disease in some cases assuming epidemic proportions. The disease was most readily identified during the warmer months between September and January. Rigorous roguing of runner beds and repeated aphid control measures are recommended.

Alexopoulos (C. J.) & Cation (D.). **Stem-end rot of Strawberries.**—*Phytopathology*, xxxviii, 9, pp. 698–706, 2 figs., 1948.

Out of 1,215 fruits of Robinson strawberries collected in a Michigan plantation at the beginning of July, 1947, 618 (50·8 per cent.) bore pycnidia closely resembling those of *Dendrophoma obscurans*, the agent of leaf blight [*R.A.M.*, xxvi, p. 346; xxvii, p. 430], which does not appear to have been previously reported in connexion with fruit rot. The fungus cultured on maltose agar from the berries, calyces, and peduncles yielded colonies and fruiting bodies indistinguishable from those produced by isolations from typical leaf blight lesions. Associated with the pycnidia of *D. obscurans* in culture and on strawberry calyces and peduncles were black, globose perithecia, 236 to 545 μ in diameter (on maize meal agar), deeply embedded in the substrate, from which their long beaks (600 to 1,455 μ in culture) project. Asci are formed, but they deliquesce on the maturation of the spores, which are released in a droplet of liquid through the ostiole. Ascospores from cultures measure 7 to 11·5 by 2 to 3 μ. Pycnidiospores of *D. obscurans* sown on potato dextrose and oat agar gave rise to perithecia, the ascospores from which yielded pycnidia on the same types of media. The perfect state of the fungus is assigned to an as yet undetermined species of *Gnomonia*.

The perithecial stage of *D. obscurans* herein described is very similar to that of *Zythia fragariae*, the causal organism of strawberry leaf blotch in England, the perfect state of which has also been tentatively referred to *G.* [*herbicola*: ibid., xxiv, p. 24]. Another pycnidial fungus occurring on strawberries which presents many analogies with both *D. obscurans* and *Z. fragariae* is *Sphaeronemella fragariae*, reported on strawberries in Louisiana and Illinois by F. L. Stevens and A. Peterson (*Phytopathology*, vi, pp. 258–267, 1916).

Other well-known rotting fungi found on the Michigan material included a *Botrytis* of the *cinerea* type, *Pezizella lythri*, *Phytophthora cactorum*, *Rhizopus nigricans* [*R. stolonifer*], and *Penicillium* sp.

Groszmann (H. M.). **Pineapple culture in Queensland.**—*Qd agric. J.*, lxvii, 2, pp. 78–100, 10 figs., 1948.

The pineapple crook-neck [cf. *R.A.M.*, xxi, p. 183] in Queensland can be cured by adding equal parts of copper sulphate and zinc sulphate to 10–6–10 fertilizer mixtures (about 56 lb. of each to each ton of the complete mixture).

Yellowing of pineapple on red basaltic soils owing to iron deficiency can be corrected by a 3 per cent. solution of iron sulphate in water, applied as a fine mist spray over the leaves at intervals of four weeks during the summer months and six to eight weeks in the cooler months.

Wardlaw (C. W.). **Infectious chlorosis of Bananas in the Cameroons.**—*Nature, Lond.*, clxii, 4127, p. 894, 1948.

During a recent visit to the British Cameroons the author observed that several plantations of Gros Michel bananas were affected by infectious chlorosis [? strain of cucumber mosaic virus: *R.A.M.*, xix, pp. 584, 662; xxi, p. 535]. *Pentalonia nigronervosa* [ibid., x, p. 472; xix, p. 482], which is known to transmit the virus, was also present. The disease appears to occur only occasionally at present, but to be capable of spreading under the local environmental conditions. Magee's

warning of the destructive possibilities of this disease should be heeded by all concerned.

Rai (J. N.). **Internal breakdown of Guava fruit (Psidium guajava L.).**—*Curr. Sci.*, xvii, 9, pp. 273–274, 1 fig., 1948.

In the course of investigations at Lucknow on guava wilt [*R.A.M.*, xxvi, p. 553], a few fruits of sound external appearance were found to be affected by an internal breakdown, originating at an early stage in their development as a slight browning in the cells of the central region and gradually involving more of the healthy tissues. The death and disintegration of the cells result in the formation of an irregular, expanding cavity, with a lining of dry, hard, brown tissue occupied by dry, blackened seeds. The affected tissue retains its dry, dark aspect even after the fruit is ripe and pulpy. In two of the fruits examined the breakdown had made considerable progress, covering about one-sixth of the internal tissue. Only one of the diseased fruits yielded bacteria, *Alternaria*, and *Fusarium* spp. in pure culture, and inoculations with these organisms gave negative results, indicating their secondary character. A physiological factor would therefore appear to be the primary cause of the trouble.

Capoor (S. P.) & Varma (P. M.). **A mosaic disease of Carica papaya in the Bombay Province.**—*Curr. Sci.*, xvii, 9, pp. 265–266, 1 fig., 1948.

A severe mosaic of papaw, first observed in March, 1947, in Bombay and in the following June in a Poona nursery, was studied in an insect-proof greenhouse, where the first symptoms appeared, about 20 days after juice inoculation, in the form of solid, dot-like, necrotic spots all over the blades of the newly developing leaves. The foliage of a fully diseased plant presents marked signs of mosaic, with blister-like patches of green tissue scattered at random all over the yellowish-green lamina, which is dwarfed and occasionally malformed, while the petiole is much stunted. Conspicuous, elongated, water-soaked areas are formed on the stem and petioles and the top leaves assume an erect position which clearly distinguishes diseased from healthy plants in a garden. The few fruits borne on infected plants are elongated, abnormally small, and unmarketable owing to the innumerable circular or concentric, water-soaked lesions, with a solid central spot, covering their surfaces.

The virus responsible for the mosaic is quite unstable and apparently of the non-persistent type, losing infectivity after 28 hours' storage *in vitro* in the laboratory, withstanding ten minutes' treating at 53° C. but not at 55°, and remaining infectious at a dilution of 1 in 1,000. As indicated above, it is sap-transmissible but was shown not to be carried by the seed. Out of 450 seeds from a diseased fruit sown, 340 germinated and gave rise only to healthy seedlings. The disease has further been transmitted by *Aphis gossypii*, collected on cotton and brinjal [egg-plant], *A. malvae* from *Lagenaria vulgaris*, *A.* sp. from *Euphorbia prolifera*, and *Myzus persicae* from *Brassica* sp., and one or more of these aphids are probably responsible for its spread in plantations. The papaw virus readily infects the Washington Special, Honey Dew, Hawaiian, Ranchi, Ceylon, Bombay, Poona Long, and Poona Round papaw varieties, *L. vulgaris*, and cucumber. The two last-named hosts develop a faint, patchy vein-clearing, accompanied by slight foliar distortion, but no typical mosaic symptoms.

Two distinct virus diseases of papaw have previously been reported, namely, bunchy top from Puerto Rico [*R.A.M.*, x, p. 398], where it is transmissible by *Empoasca fabae* [ibid., xxvi, p. 553], China [as 'mosaic': ibid., xv, p. 385], and possibly India [as 'leaf crinkle': ibid., xviii, p. 750]; and mosaic from Hawaii (*Proc. Amer. Soc. hort. Sci.*, xxxvi, p. 263, 1939; *Bull. Hawaii agric. Exp. Sta.* 87,

p. 43, 1941), [Brazil, Venezuela, Puerto Rico, and Tanganyika: *R.A.M.*, xxi, pp. 88, 324; xxvi, p. 458; xxvii, p. 483]. Diseases of doubtful origin have been recorded by Simmonds from Queensland ['yellow crinkle': ibid., xviii, p. 502] and Baker from Trinidad ['mosaic': ibid., xviii, p. 808]. The disorder herein described, however, appears to be caused by yet another virus.

The only prospect of control lies in the extermination of all diseased plants to arrest the spread of the virus.

Copper compounds in agriculture and industrial microbiology.—117 pp., 46 figs., Copper Development Association, Kendals Hall, Radlett, Herts., 1948.

The aim of this manual is to provide a useful and convenient summary of the various applications of copper compounds, primarily for plant-disease control, which necessitates an estimated annual consumption throughout the world of 350,000 tons of copper sulphate, containing nearly 90,000 tons of copper. Reference is also made, *inter alia*, to the use of these compounds as seed dressings, timber and textile preservatives, and in the control of copper deficiency diseases of plants.

McCallan (S. E. A.). **Characteristic curve for the action of copper sulphate on the germination of spores of Sclerotinia fructicola and Alternaria oleracea.** —*Contr. Boyce Thompson Inst.*, xv, 2, pp. 77–90, 3 graphs, 1948.

In obtaining the dosage-response curves for the action of copper sulphate on the spore germination of *Sclerotinia fructicola* and *Alternaria oleracea* [*A. brassicicola*], 34 concentrations of copper from 0·105 to 32 p.p.m. with a dosage ratio of $\sqrt[4]{2}$ were used, 1,000 spores were counted at each concentration, and the entire test run three times, thus giving about 100,000 spores for determining the characteristic curve. Germination was defined as the production of a germ-tube exceeding half the diameter of the spore. Germination prior to the tests was determined and non-germination of the control spores. The final percentage inhibition of germination for treated spores was derived from the formula $100\,\frac{C-T}{C-P}$, where C and T are percentages of observed germination in the control and treated spores, respectively, and P is the percentage of prior germination in the control. Smooth curves concave upwards were obtained when probit inhibition of germination was plotted against the logarithm of concentration [cf. *R.A.M.*, xx, p. 543; xxvii, p. 247]. The Langmuir adsorption equation failed to give a satisfactory fit. By means of the Parker-Rhodes α exponential transformation of concentration [ibid., xxi, p. 422] a straight line resulted for the regression of probit inhibition on concentration $^{\alpha}$. For *S. fructicola* $\alpha = 0{\cdot}41$ and $\hat{Y} = 1{\cdot}354\,X + 0{\cdot}59$ and for *A. brassicicola* $\alpha = 0{\cdot}56$ and $\hat{Y} = 0{\cdot}525\,X + 1{\cdot}873$. These regressions are highly significant. The exponential transformation is an advantage over the logarithmic transformation and appears equally logical. A negative α transformation is required to straighten convex curves of the zinc chloride type. Germ-tube length, expressed as a percentage of the length in the controls, when plotted against percentage germination, gave an asymmetrical sigmoid curve. The two are highly correlated but no simple and logical function has been found to express their relationship.

[An abstract of this paper also appears in *Phytopathology*, xxxvii, 11, pp. 848–849, 1947.]

McCallan (S. E. A.). **Some improvements in equipment for evaluating fungicides by the foliage disease method.**—*Contr. Boyce Thompson Inst.*, xv, 2, pp. 71–75, 2 figs., 1 graph, 1948.

The improved equipment for evaluating fungicides by means of tomato foliage diseases [cf. *R.A.M.*, xxiii, p. 34] is housed in a basement laboratory measuring

28 by 23 ft. illuminated by skylights and fluorescent lighting and equipped with three insulated, temperature-controlled incubation chambers run at 100 per cent. relative humidity and fitted with fluorescent lighting. The internal chamber dimensions are 6 by 5 by 3 ft. One is set at 70° F. for tomato early blight (*Alternaria solani*) and another at 60° for late blight (*Phytophthora infestans*) and snapdragon [*Antirrhinum majus*] rust (*Puccinia antirrhini*) as determined from incubation temperature-infection experiments. A stainless steel, compound turn-table for spraying, inoculating, and 'raining' tap or distilled water on plants is motor driven at 15 r.p.m. and is set in a flexboard hood mounted on a 5 by 3 ft. stone base. The hood has a capacity of 500 cu. ft. air per minute.

Pady (S. M.), Kelly (C. D.), & Polunin (N.). **Arctic aerobiology, II.**—*Nature, Lond.*, clxii, p. 379, 1 map, 1948.

On the 51 agar plates exposed during Arctic survey flights over North-West Territories, Canada [*R.A.M.*, xxvii, p. 248], the bacteria trapped greatly outnumbered the fungal colonies. A preliminary identification of the latter shows that *Hormodendrum* sp. [ibid., xviii, p. 44] occurred in 33 of the 207 cultures examined, which included 20 other Moniliales, one *Phyllosticta* sp., one *Pestalotia* sp., 16 yeasts, 15 *Penicillium* spp., nine *Leptosphaeria* spp., one *Chaetomium* sp., and 22 *Streptomyces* spp. There appears to be no correlation between the number of colonies and geographical position within the arctic and sub-arctic regions.

Emendations to the third edition of the List of Common British Plant Diseases. By a Sub-Committee of the Plant Pathology Committee of the British Mycological Society.—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 340–342, 1948.

Since the appearance of the third edition of the List of Common British Plant Diseases in 1944 [*R.A.M.*, xxiv, p. 425] certain emendations and additions have become necessary. These are given in the present paper. Specific epithets have been decapitalized, and, until there is a generally accepted set of international names for viruses, the common names used for virus nomenclature in the *Review of Applied Mycology* (Special Part, xxiv, 13, 1946) are accepted.

Attention may be drawn to the following items. The name for brown rust of barley (*Puccina hordei* Otth (1871)) was regarded in 1939 as a *nomen ambiguum*. Buchwald, however, re-stated his case [ibid., xxv, p. 107] and has now supplied a valid name for the homonym *P. hordei* Fuckel (1873). *P. hordei* Otth, the valid name under the Rules, has been accepted by the United States Department of Agriculture [ibid., xxvi, p. 99], and the authors recommend that it be accepted in Great Britain also. In view of the confusion over the names *P. anomala* and *P. simplex* it is hoped that *P. hordei* Otth will be adopted everywhere (p. 12).

Under chocolate spot of broad and field bean (p. 13), the words 'and *B. fabae* Sardiña' should be added. Under flax (p. 21), to *Fusarium lini* should be added the synonym *F. oxysporum* Fr. f. *lini* (Bolley) Snyder & Hansen, and after flax rust, 'mildew . . . *Oidium lini* Škorić'. On p. 23, under 'grasses' the entry 'stripe smut . . . *Ustilago striiformis* (Westend.) Niessl' remains unchanged; Stevenson's view is endorsed that the earlier name *U. salvei* B. and Br. should be regarded as a *nomen ambiguum* [ibid., xxvi, p. 82]. With regard to oak mildew (p. 27), Robertson and Macfarlane's report of a few perithecia, which they identified as *Microsphaera alphitoides* Griff. & Maubl., is noted [ibid., xxvi, p. 363]. Stevenson and Johnson's recommendation [cf. ibid., xxiv, p. 52] of the citation (p. 28) *Ustilago avenae* (Pers.) Rostr. (1890), is accepted as Jensen in 1889 used the binomial *U. avenae* as a *nomen nudum*. As Petch (1945) strongly reinforced the view expressed on p. 7 that 'it might have been even better to accept *Calonectria nivalis* Schaffnit' instead of *C. graminicola* Wollenw., it is proposed that *C. nivalis* be accepted for turf snow mould (p. 40).

KUHNHOLTZ-LORDAT (G.) & BLANCHET (G.). **Flora des environs immédiats de Montpellier. Tome I. La prospection phytopathologique. Tome II. Les végétaux vasculaires et leurs parasites cryptogames.** [Flora of the immediate environs of Montpellier. Volume I. Phytopathological surveys. Volume II. Vascular plants and their fungal parasites.]—117+457 pp., 2 pl., 3 figs., 3 maps (one folding), 2 diags., Paris, Paul Lechevalier, Éditeur, 1947, 1948. Fr. 1,800.

The first volume (by Kuhnholtz-Lordat) of this useful and important publication is divided into two parts dealing, respectively, with the general concept of the florula and collecting. The points covered by the first part include knowledge of the hosts, local surveys of hosts, reasons for the incompleteness of these, and the need for repeated surveys, receptive phases of hosts and saprophytic phases of parasites, and incompletely known life-cycles. The second part deals with the observation, selection, collection, preservation, and deposition of specimens from a practical point of view, and concludes with a chapter on mapping phytopathogens.

The second volume (by both authors) provides the student with a means whereby he can identify the plant parasites within an area of 10 to 12 km. radius from Montpellier. It comprises an annotated list of hosts with their parasites and hyperparasites collected up to 31st December, 1947, on phanerogams and ferns. The hosts are arranged alphabetically under common and generic names. Where necessary, keys are provided for identifying specific hosts whether wild or cultivated species or hybrids. Adventitious species appear in the key if sufficiently stabilized. Plants sometimes abundantly present and at other times absent are also given. All the hosts are followed by a list of their fungal, bacterial, or phanerogamic parasites found in the locality concerned, in some cases accompanied by systematic, local, or phytopathological notes. A most useful lexicon to popular descriptive terms connoting diseased conditions is provided (pp. 411–429) and there is a classification, together with keys, of the principal orders of fungi, and an alphabetical list of the parasites with their hosts indicating those of special local abundance or interest.

SINGH (U. B.). **Phytopathological examination of seeds by Ulster method.**—*Curr. Sci.*, xvii, 9, pp. 266–267, 1948.

Seeds of four types of groundnut, four of tobacco, and two of castor (*Ricinus communis*) were examined by the Ulster method [*R.A.M.*, xx, p. 261] at the United Provinces (India) Department of Agriculture prior to the issue of phytopathological certificates for export to China. The percentages of parasitic fungi (*Fusariun* sp., *Rhizoctonia* [*Corticium*] *solani*, and *Cercospora personata*) in the four types of groundnut were 80, 50, 22, and 98; of healthy seeds in the four types of tobacco, 83, 90, 93, and 30; and of the parasitic fungus *Cercosporina ricinella* in the two types of castor [ibid., xv, pp. 683, 779] 26 and 29. The incidence of contamination by *Aspergillus niger* amounted to 10, 50, 75, and 2 per cent. in the four types of groundnut, to 11, 8, 5, and 49 per cent. in the tobacco, and to 74 and 71 per cent. in the castor seeds.

LA TOUCHE (C. J.). **Slide-traps for soil fungi.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 281–284, 1 fig., 1948.

In studies on fungi growing in the casing soil of mushroom beds and the underlying compost, as well as in soil incubated in beakers, the author was able to isolate fungi growing actively in the soil by the use of a simple device which has many advantages. This consists of two standard hanging-drop slides clipped together with their concavities facing each other and with a little agar medium enclosed between them. A culture chamber is thus provided to which fungi can gain access by growing in

between the slides from the surrounding soil. The moisture of condensation which collects between the slides enables growth to take place until the agar is reached.

When collections are made in mushroom beds, the surface soil is scraped away with a sterile knife to a depth of $\frac{1}{4}$ in., and the slide-traps are flamed and pushed in edgeways vertically or horizontally until completely buried. The surface soil is then replaced. In beakers, a layer of casing soil several inches thick is added first, and the traps are partly immersed in it, and then covered over completely with soil. After a suitable period of immersion (generally a week in soil incubated in beakers at 22° C., and a fortnight to three weeks in mushroom beds), the traps are removed and examined under the microscope. If the hyphae have not reached the agar, the traps may be incubated in a moist chamber until growth is well established. When the agar has become invaded it is removed whole, or divided if invaded from different sides, and placed on sterile agar medium in a Petri dish, from which isolations may later be made.

Schmidt (W. H.), Reeves (M. D.), Castle (F. J.), & Benedict (R. G.). **An automatic agar dispenser.**—*Nature, Lond.*, clxii, 4127, p. 903, 1 fig., 1948.

A description is given of an automatic agar dispenser originally designed for the rapid, reasonably accurate transfer of melted agar to plates for subsequent use in the assay of penicillin. The device consists of a constant-head glass reservoir, the size of which depends on the quantity of agar to be dispensed, emptying through a modified solenoid valve connected with an electronic timer. The glass seat for the ball valve should be flattened so that no leakage can occur when the stainless steel ball is in its normal position. When the micro switch is pressed, the solenoid must not lift the ball, but roll it to one side. Any timer, mechanical or electronic, which makes or breaks a circuit may be used, the accuracy of the device depending upon the accuracy of the timer. For routine plate-pouring (20 ml. per plate) the authors use a vessel with a total capacity of 2 l., while for flooding assay plates (4 ml. per plate) a 500-ml. receptacle is employed, to which a smaller delivery tube is attached.

Sterilization of the reservoir and valve is effected by passing steam through from the top, or by autoclaving. The constant-head device and the delivery tip are sterilized separately in an Arnold steamer.

With this apparatus one operator can deal with 30 plates in three minutes. It is simpler and quicker than agar delivery by pipette and more accurate than pouring plates from tubes containing measured amounts of the materials.

Metal caps for test tubes.—*Nature, Lond.*, clxii, 4128, p. 920, 1948.

Aluminium alloy caps to slip over the tops of test-tubes to replace cotton-wool plugs for culture work are recommended, by Oxo Ltd., Queen St. Place, E.C. 4, who have used them in their own laboratories for some time. The advantages claimed are that the media remain sterile for longer periods and are uncontaminated by fibres; tubes fitted with the caps can be sealed with 'cellophane' and labelled with an ordinary pencil which withstands autoclaving. They are durable, easily manipulated, and do not adhere to the mouth of the tube; they can be cleaned by boiling in 0·5 per cent. caustic soda, followed by rinsing and drying. They are supplied in three sizes to fit standard test-tubes having outside diameters of $\frac{5}{8}$, $\frac{3}{4}$, and 1 in.

DeLamater (E.). **Basic fuchsin as a nuclear stain for fungi.**—*Mycologia*, xl, 4, pp. 423–429, 1 fig., 1948.

Three procedures for staining fungi with basic fuchsin were developed in cytologic studies at the Mayo Clinic, Minnesota, on certain fungi pathogenic to man which do not react adequately with Feulgen. They produced clear and beautiful preparations which appear to hold considerable promise for studying nuclear

phenomena in fungi. The stain produced by a 0·5 per cent. aqueous solution of basic fuchsin in N/25 hydrochloric acid can be made permanent by mordanting hydrolyzed cells in 1 to 4 per cent. formalin solution for two to four minutes prior to staining, or by combining 2 per cent. formalin with the stain. These procedures require preliminary, carefully controlled hydrolysis with hydrochloric acid comparable to that used in the Feulgen technique.

Kefford (J. F.). **Effect of ozone on microbial growth on beef muscle, and on the flavour of beef fat.**—*J. Coun. sci. industr. Res. Aust.*, xxi, 2, pp. 116–140, 3 figs., 7 graphs, 1948.

In experiments in which Czapek agar plates inoculated with *Penicillium* No. B 59 were held at 25° C. for 24 hours (until growth commenced), a daily 5 p.p.m. ozone treatment for three hours caused a marked retardation of subsequent growth at 5°. No growth occurred after 14 days in ozone-treated plates stored immediately after inoculation at 5°. Plates inoculated with *Sporotrichum* No. B 79 showed no growth under either set of conditions. When agar plates were ozonized for a total period of 50 hours and then sprayed with *P.* No. B 59 at 5°, mould appeared after 37 days; on the controls growth was visible after 7 days.

Beef muscle slices with 75 per cent. moisture content were sprayed with a spore suspension of *P.* No. B 59 and stored at 5° and 95 per cent. room humidity. No mould had appeared on ozonized slices by the 25th day when the experiment was concluded, while corresponding slices stored in air showed mould on the 15th day.

Leutritz (J.). **The effect of fungi and humidity on plastics.**—*A.S.T.M. Bull.* 152, pp. 88–90, 1 fig., 1 graph, 1948.

An account is given of experiments performed to obtain further confirmation of the conclusion reached in a previous study by the author and D. Herrmann (*A.S.T.M. Bull.* 138, p. 25, 1946) that the lowered insulation resistance of electrical, electronic, and communications equipment at high relative humidities observed in the south-west Pacific during the late war was chiefly a moisture phenomenon, fungal damage being of secondary importance [cf. *R.A.M.*, xxv, pp. 174, 571].

Cellulose (wood-flour filled) phenolic plastics were subjected to burial tests in a soil in which the presence of wood-destroying fungi had been demonstrated by the exposure of wooden blocks and other cellulosic materials. After 16 to 24 weeks, wood lost 10 to 20 per cent. of its weight and was disintegrated, whereas at the end of 52 weeks the plastics showed no change either in weight or flexural strength. Wood-flour filled phenolic plastic terminal blocks were exposed for 26 weeks to cultures of *Poria incrassata*, but despite the heavy growth of the fungus there was no loss of weight or evidence of damage.

A single combined field and laboratory exposure was made comparing a para-phenyl phenol formaldehyde tung oil varnish and a cellulose nitrate lacquer containing a mercurial fungicide. Filter papers impregnated with the varnish were completely covered with fungal growth when exposed in a nutrient agar system, but the paper treated with a cellulose nitrate lacquer showed a zone of inhibition round the specimen because of the initial water-soluble toxicity due to the mercury compound. On the other hand, when comparable samples were exposed for 11 months in the tropics and then for a month in a chamber at 100 per cent. relative humidity, the varnish was free of fungal growth while the lacquer was entirely covered. The tung oil evidently did not furnish sufficient nutriment for the fungi, and the mercurial fungicide was not stable enough to protect the cellulose nitrate, which provides a certain amount of sustenance.

The author's field observations on equipment stored under various conditions in tropical areas do not substantiate the claim of fungal responsibility for damage to plastics. Though fungi were observed on many types of surfaces, including glass

[ibid., xxvi, p. 71] and metals, in no instance could their growth be shown to cause functional failure of electrical equipment or physical injury either to electrical or mechanical grades of plastics.

Analysis of the conditions leading to fungal growth on various materials and the engineering factors involved may be summed up as follows. Materials of biological origin, such as cellulose and leather, may serve as foci for the spread of hyphae across the surfaces of inert plastics, e.g., methyl methacrylate. Consequently, the use of such vulnerable materials in the tropics or damp climates should be reduced to a minimum. Unless impregnated with a fungicide, functional failure of cellulose and leather will finally ensue, and they should be replaced by materials of proved resistance to moisture and fungal infection. A large part of the trouble arising from these sources may be overcome by due attention to design, including the hermetic sealing of components and ventilation by heat and blowers, or both. Insulating surfaces should be placed in a vertical rather than in a horizontal position to keep them relatively free of organic dust and insect debris, which often serve as foci of fungal infection.

Vapour-proof barriers, specifically metallic foil and cans, ensure the arrival of the equipment in the tropics in a satisfactory condition for immediate use. In numerous tests on packages wrapped in bitumen-impregnated paper and containing silica-gel drier the indicator showed the relative humidity inside the layers of wrapping to be at or near 100 per cent., and on opening the package free water was often found.

During continuous or short periods of intermittent operation of electrical equipment, no difficulties were experienced with moisture and fungus. After long inoperative periods in the jungle, functioning could be restored after drying in spite of the frequently heavy fungal growth on friction tape and insect debris. The complete elimination of fungal growth from an electric surface for the service life of the material is neither a feasible nor an essential engineering approach.

Galloway (L. D.). **Testing rot-proofness of cellulosic fabrics.**—*Text. Mfr, Manchr*, lxxiv, 883, pp. 332–334, 2 figs., 1948.

This is a useful summary and discussion of the relative merits of current methods of testing the rot-proofness of cellulosic fabrics, i.e., by chemical criteria and biological tests, the latter falling into two main classes, soil exposures and pure cultures. A valuable adjunct to the soil burial method is the mildew test, applicable to fabrics not intended for exposure to outdoor conditions but liable to develop mould growth in storage in a damp atmosphere. It consists in the exposure, side by side in the saturated space above a layer of water in a closed glass vessel incubated at 25° C., of small rolls of treated and untreated cloth, which have either been sprayed with a mixed suspension of mould spores or merely left uncovered in a dusty atmosphere.

Jefferys (E. G.). **A technique for rapid demonstration of the production of anti-fungal substances by fungi or other microorganisms.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 246–248, 1948.

A rapid method for testing a large number of fungi or other micro-organisms for the production of anti-fungal substances is described. A glass rod, 7 mm. in diameter, is bent three times at right angles to form a rectangular cell of 1 in. by 2 in. internal dimensions, which is flamed and placed in a sterile Petri dish. Enough molten, sterile Czapek-Dox (or other) agar is poured into the cell to seal it to the base of the dish on cooling. When the agar has set, the cell is filled with agar and again left to cool. Any agar flowing over the edge of the cell or through the gap between the two ends of the rod is removed. The agar surface is then inoculated with a streak of the fungus to be tested. After two or three days' inoculation at 25° C., or

when good growth has occurred, the cell is prised off, turned over, and transferred to a second sterile dish. The newly exposed surface is then inoculated with a spore suspension of *Botrytis allii* or other standard test fungus. After a further 16 to 18 hours' incubation, the upper surface is examined to determine the degree of inhibition of germination.

WAKSMAN (S. A.). **Antibiotics.**—*Biol. Rev.*, xxiii, 4, pp. 452–487, 1948.

This comprehensive survey and discussion of the phenomenon of antagonism or antibiosis among micro-organisms falls into the following sections: I, introductory; II, nature of antibiotics; III, background of antibiotics, subdivided into (1) early observations, (2) chemotherapeutic experiments, and (3) a new approach; IV, present status of antibiotics, comprising (1) types of antibiotics, (2) isolation of new antibiotics, (3) antibiotics as chemotherapeutic agents, (4) the problem of resistance, (5) mode of action of antibiotics, and (6) antibiotics in natural processes; V, the future of antibiotics; VI, summary; and VII, a three-page bibliography.

FRIES (N.). **The nutrition of fungi from the aspect of growth factor requirements.**—*Trans. Brit. mycol. Soc.*, xxx, pp. 118–134, 5 figs., 1948.

The author briefly reviews and discusses, with many references to the relevant literature, some of the results obtained by numerous workers during the past twelve years on growth factor requirements in the nutrition of fungi. The growth factors so far known are listed and their effects on fungi discussed from the biochemical and physiological points of view. A brief account is also given of the possible part played by growth factors in fungal metabolism.

DENNY (F. E.). **The role of the surface micro-flora in measurements of the respiration rate of germinating seed.**—*Contr. Boyce Thompson Inst.*, xv, 4, pp. 211–227, 3 figs., 1948.

Measured respiration rates of plant parts include in the total carbon dioxide produced that due to any micro-organisms present on or in the tissues. The respiration of bacteria present on diseased hyacinth bulbs was found by Dolk and van Slogteren to be greater than that of the bulbs [*R.A.M.*, x, p. 386]. Similarly, investigations into the storage of grain have shown that when humidity in the bin favours the development of micro-organisms, the respiration occurring is mainly due to them [ibid., xxiv, p. 53].

In the present experiments [which are fully described] the author compared the respiration of untreated and chemically disinfected soaked seeds of various kinds at the early stage of germination. The results indicated that only with wheat and rye was there a small, but significant, excess of respiration due to micro-organisms, the seeds dipped in water showing about 10 per cent. higher carbon dioxide production than the chemically treated seed.

MARGOLIN (A. S.). **The carbohydrate requirements of Diplodia macrospora.**—Reprinted from *Proc. W. Va Acad. Sci.*, xiv, pp. 56–59, 1940. [Received December, 1948.]

Experimental evidence indicates that *Diplodia macrospora* [*R.A.M.*, xxvi, p. 130] in nutrient solution grows equally well when dextrose, sucrose, and maltose are supplied with the necessary auxithal, namely, biotin [ibid., xxvi, p. 411] or a biotin-like substance. Practically no growth occurs on any of these sugars if the auxithal is absent. Purification of brown sugar with norit (activated charcoal) resulted in a considerable growth decrease from 132·5 mg. to 7 mg. dry weight per colony, evidently due to the removal of the auxithal, present as an impurity, while the addition of biotin extract restored the growth. [This paper was also printed in *W. Va Univ. Bull.*, Ser. 41, iv, 2, 1940.]

Wilson (J. K.). **An examination of the exudate and juice of certain fungi found in their native environment.**—*Mycologia*, xl, 5, pp. 605–613, 1 pl., 1 graph, 1948.

Examination of the watery exudates oozing out of the sporophores of *Polyporus dryadeus*, *P. sulphureus*, and *Fistulina hepatica* growing under natural conditions, showed that the total solids ranged from 1·7 to 2·72 per cent., and that each ml. contained 6,000 to 32,100 bacteria (of three species) and actinomycetes (one species), which, despite the acidity (pH 2·6 to 2·85 for *P. dryadeus*, 3·57 to 3·8 for *P. sulphureus*, and 3·6 to 3·8 for *F. hepatica*) increased if the exudate was held for three days.

Akeley (R. V.), Stevenson (F. J.), & Schultz (E. S.). **Kennebec : a new Potato variety resistant to late blight, mild mosaic, and net necrosis.**—*Amer. Potato J.*, xxv, 10, pp. 351–361, 1948.

Kennebec (U.S.D.A. seedling No. B 70–5), a new potato variety developed at the Plant Industry Station, Beltsville, Maryland, possesses good commercial qualities and a high degree of resistance to blight (*Phytophthora infestans*) [*R.A.M.*, xxvii, p. 539] in both tubers and vines. In field exposure tests it was also highly resistant to mild mosaic [loc. cit.] and did not develop net necrosis [ibid., xxvii, p. 85] in the tubers. It is late-maturing in Maine, but medium-late in other States.

Hänni (H.). **Warum trat die Kraut- und Knollenfäule (Phytophthora infestans de By) 1946 in der Schweiz so früh und so stark auf ?** [Why did late blight (*Phytophthora infestans* de Bary) develop so early and so intensively in 1946 in Switzerland?]—*Schweiz. landw. Mh.*, xxiv, 8, pp. 227–232, 4 figs., 1946.

For many years past the earliest outbreaks of potato blight (*Phytophthora infestans*) in Switzerland have occurred in the first week of July, but in 1946 an epidemic developed in the canton of Thurgau in mid-June [*R.A.M.*, xxvii, p. 220]. There were 15 wet days in May, followed by a rainy spell from 8th to 25th June, which was particularly critical for the spread of the disease. The primary focus of infection was located in the field next to a crop of diseased Eerstelingen [Duke of York] at Immensee, in the central region of the country. On 26th September, 1945, a fairly severe attack of blight had been observed on a crop of late potatoes in the same field, which at the time of the outbreak on the Duke of York variety was carrying a crop of Huron wheat. Growing in the shelter of the latter were a number of 'volunteer' potato shoots heavily infected by *P. infestans*, the sporangia of which had obviously been borne on the prevailing wind to the early crop and thence over distances up to 20 km. away.

On 4th June, 1946, 2 are [= 200 sq. m.] of a Bintje plot were sprayed with 1 per cent. copper oxychloride (cuprenox), leaving 50 sq. m. in the middle untreated, and the whole plot was then lightly sprinkled with a spore suspension. All the untreated plants were attacked by the 21st June, whereas those sprayed showed only a few isolated spots which had spread no farther by mid-July.

Ballu (T.). **Récents essais de poudrage et de pulvérisation sur Pommes de Terre.** [Recent Potato dusting and spraying trials.]—*C. R. Acad. Agric. Fr.*, xxxiv, 11, pp. 726–727, 1948.

Trials were carried out recently at Grignon on potato crops using several atomizer spraying machines, three portable dusters in which the blast-apparatus is controlled by means of a battery, thus obviating the manipulation of levers, and two tractor-drawn machines capable of great output, one mounted on a special framework and another towed by a jeep. Another, mounted on a jeep, moved at 15 km. and dusted 10 ha. an hour. A biplane duster working at crop height gave a fine, regular deposit with a spread of 15 m.

Harry (J. B.), Wellman (R. H.), Whaley (F. R.), Thurston (H. W.), & Chandler (W. A.). **Development of copper-zinc-chromate complexes as Potato fungicides.** —*Contr. Boyce Thompson Inst.*, xv, 4, pp. 195–210, 1 pl., 2 graphs, 1948.

Laboratory and greenhouse bioassays at the Pennsylvania Agricultural Experiment Station demonstrated the fungitoxic properties of the chromate complexes at concentrations of from 0·0001 to 0·03 per cent., higher concentrations being phytotoxic. The complexes do not go into solution as units; the water causes a change in their composition, a property which is reversible. This indicates that the basic chromates are distinct and reproducible chemical entities the ratios of whose components are capable of being varied continuously over a wide range of composition.

Low-copper high-zinc chromate complex (169) at 4 to 6 lb. in 100 gal. water controlled early and late blight of potatoes [*Alternaria solani* and *Phytophthora infestans*] in Pennsylvania, Florida, and Long Island in 1945, the yields being as high as from those treated with Bordeaux mixture. Complex 169 was used effectively combined with DDT.

Performance of the complexes as potato fungicides was found to be correlated with ratios of zinc to copper to chromium, and completeness of reaction of the product; a medium high-copper low-zinc chromate complex (658) at about 2 lb. to 100 gals. was as effective as 4 to 6 lb. of complex 169. Chromates, at little more than one-third the copper content of Bordeaux mixture and fixed coppers, were more effective than these standard treatments.

Binkley (A. M.), Kunkel (R.), & Edmundson (W. S.). **The effect of chemical vine killers on yield and quality of Red McClure and Bliss Triumph Potatoes.**—*Amer. Potato J.*, xxv, 10, pp. 371–376, 1948.

During 1946 in tests with various potato vine killers [*R.A.M.*, xxvii, p. 581] at the Colorado Potato Station, Greeley, on Bliss Triumph the untreated tubers showed more stem-end discoloration than those from treated plots, but at the San Luis Valley Branch Station the reverse was the case with the Red McClure variety. In 1947 the results with the same variety at the San Luis Valley Station indicated that when the tubers were dug about two weeks before the normal harvest time, there was a significant decrease in the yield of tubers more than 2 in. in diameter. Killing the vines prematurely (two weeks before harvesting or the onset of frost) resulted in a lower specific gravity of the tubers, but did not decrease the number of tubers over 2 in. in diameter. Under Colorado conditions dowspray 66 [loc. cit.], alone or in combination with aluminium or copper sulphate, and sinox [loc. cit.] were most effective. In 1947 none of the vine killers tested caused a significant increase of stem-end discoloration.

Chemical prevention of Potato dry rot disease.—*Nature, Lond.*, clxii, 4126, p. 843, 1948.

Bayer Products, Ltd., of Crawley, Sussex, have developed a preparation for the prevention of dry rot of potato tubers caused by *Fusarium caeruleum* [*R.A.M.*, xxvii, p. 292]. This product, 'fusarex', is based on 2,3,5,6-tetrachlornitrobenzene. It is most effective when applied to the tubers immediately on lifting, followed by four to six weeks' storage in a clamp. There is no need to cover each potato completely, provided the product is evenly distributed through the mass of tubers. A simple, manual application suffices. It has also been ascertained that suitable fusarex treatment and storage conditions can delay sprout development. The treatment of main-crop varieties against sprouting is now a practical proposition, and special techniques are being devised for early varieties. Tetrachlornitrobenzene

is of such a low order of toxicity that it can be regarded as non-poisonous under the conditions of use suggested.

KNORR (L. C.). **Suscept range of the Potato ring rot bacterium.**—*Amer. Potato J.*, xxv, 10, pp. 361–371, 1948.

This paper contains a table of 24 species of *Solanum* and one of *Athenaea*, arranged alphabetically under the Latin binomials, newly reported as susceptible to ring rot (*Corynebacterium sepedonicum*) [*R.A.M.*, xxvii, p. 492] in inoculation tests at Michigan State College and a list of 45 additional species which show no reaction to inoculation. Tomato was found to be the most reliable indicator for testing questionably infected material. Of 11 *S. demissum atypicum* plants inoculated at various times over a period of two and a half years, four showed external symptoms of ring rot infection. On the other hand none of the 28 inoculated plants comprising *S. demissum* f. *tlaxpehualcoense*, *S. demissum* El desierto, *S. demissum* Rio Janeiro, *S. demissum atrocyaneum* El desierto, and *S. demissum xitlense* El desierto was susceptible. Extensive tests carried out by Dr. Reddick have shown that the typical *demissum* strains are consistently immune from blight [*Phytophthora infestans*], whereas the strains *atypicum* are consistently susceptible. This discrepancy between the two strains as to blight and ring rot susceptibility may have its explanation in a heterozygosity of resistance factors in the *atypicum* variant. Resistance to or immunity from ring rot of *S. demissum* may be an additional factor in favour of using it as parental material in a potato breeding programme.

ROY (T. C.). **Study on the soil fungi of the Paddy fields of Bengal.**—*Bull. bot. Soc. Bengal*, ii, 1, pp. 28–35, 1 graph, 1948.

Further studies of rice field soil fungi [*R.A.M.*, xix, p. 302] from an area adjacent to that previously examined at the Chinsurah Agricultural Farm but giving a higher yield revealed that *Aspergillus niger* was present in all soil samples at depths ranging from 1 to 6 in. The greatest number of fungi was found at a depth of 4 in., owing to the relatively high moisture content; it markedly decreased at lower depths. Of the 19 species isolated, only five were found in the 1939 test (*Mucor hiemalis*, *Rhizopus nigricans* var. *minutus* [*R. stolonifer* var.], *R.* sp. 1., *A. niger*, and *A. fumigatus*). The rest were not previously encountered and were mostly *A.* spp. and *Penicillium* spp. plus *Cladosporium herbarum* and *Alternaria humicola*.

SPARROW (F. K.). **Soil Phycomycetes from Bikini, Eniwetok, Rongerik and Rongelap Atolls.**—*Mycologia*, xl, 4, pp. 445–453, 19 figs., 1948.

Notes are given on 20 species of *Rhizophlyctis* and descriptions of the chytridiaceous parasites *Olpidium rhizophlyctidis* n.sp. and *Rhizophidium marshallense* n.sp. isolated from 22 of 44 soil samples obtained from the Bikini, Eniwetok, Rongerik, and Rongelap Atolls in the Marshall Islands [*R.A.M.*, xxvi, p. 421].

KATZNELSON (H.), LOCHHEAD (A. G.), & TIMONIN (M. I.). **Soil microorganisms and the rhizosphere.**—*Bot. Rev.*, xiv, 9, pp. 543–587, 1948.

The methods of studying the microflora of the rhizosphere [*R.A.M.*, xxviii, p. 21] are reviewed and the quantitative and qualitative effects of higher plants on soil micro-organisms, together with other microbiological phenomena associated with plant roots, are discussed. A bibliography of 137 references is appended.

SALMON (E. S.). **Thirtieth report on the trial of new varieties of Hops, 1946.**—*J. Inst. Brew.*, N.S., xlv, 1, pp. 7–16, 1948.

In addition to a note on the great promise shown by the OR 55 hop variety,

resistant to *Verticillium* [*albo-atrum*], this report mentions the superior qualities of the early FF 21 and the late K 1: *R.A.M.*, xxvii, p. 296. The former, like Fuggle and most of the new varieties, is tolerant of the hop mosaic virus [loc. cit.], carrying it without the adverse effects shown by Bramling, from which it was bred. K 1 has been found moderately resistant to downy mildew [*Pseudoperonospora humuli*] both at Wye and East Malling.

MATSUMOTO (T.). **An annotated list of Sugarcane diseases in Formosa and remarks on the taxonomy of some of their causal organisms. I.**—*J. Soc. chin. trop. Agric.*, i, 1, pp. 12–16, 1948. [Chinese summary.]

The diseases comprised in this annotated list of sugar-cane pathogens in Formosa are arranged in the form of a key with descriptive notes according to the part affected as follows. I. Lesions mostly on leaves. A. Round or elongate spots on leaves: (1) ring spot (*Leptosphaeria sacchari*); (2) eye spot (*Helminthosporium sacchari*); (3) brown stripe (*Cochliobolus stenospilus*); (4) leaf blight (*Cercospora taiwanensis* Matsu. & Yamamoto); (5) rust (*Puccinia kuehnii*); and (6) purple spot caused by *Venturia sacchari* (v. Breda de Haan) Sacc. or *Eriosphaeria sacchari* (v. Breda de Haan) Went. B. Yellowish streaks or stripes on leaves: (7) [sugar-cane] mosaic virus; (8) downy mildew (*Sclerospora sacchari*). C. White streaks more noticeable, at least in the incipient stage: (9) leaf scald (*Bacterium* [*Xanthomonas*] *albilineans*). D. Red streaks on leaves: (10) red stripe (*Bact.* [*X.*] *rubrilineans*). E. Irregular, large patches on leaves: (11) banded sclerotial disease (*Corticium sasakii*); (12) yellow spot (*Cercospora kopkei*); (13) olivaceous, black, and brownish sooty moulds (*Fumago vagans*, *Caldariomyces fasciculatus* [*R.A.M.*, xviii, p. 56], and *Chaetothyrium spinigerum*); and (14) banded or cold chlorosis [ibid., xx, p. 425; xxii, p. 198, *et passim*].

The first symptoms of *Cercospora taiwanensis* on the immature leaves are small, narrow, elliptical or elongated, yellowish spots, which subsequently assume reddish tints and extend into long streaks or bands through coalescence. At an advanced stage of infection a reddish-brown tinge spreads all over the leaf surface, except for some narrow, elongated green strips which also finally turn brown. The author's attention was first directed to the leaf blight in the spring of 1933, when it was largely restricted to the eastern part of the island; during the subsequent rainy season, however, it spread to the southern districts. The P.O.J. 2883 variety is the most susceptible, P.O.J. 2878 fairly so, and P.O.J. 2725 moderately resistant.

V. sacchari forms on both leaf surfaces numerous small, circular or irregular, purplish-brown spots. First observed by Sawada in Taipeh Prefecture (northern Formosa) in 1925, the distribution of purple spot on the island has not yet been investigated.

LO (T. T.). **The resistant tests of H. 1381 and P.O.J. 3016 on red rot and pineapple disease.**—*Sugarcane Res., Taiwan*, ii, 6, pp. 9–18, 1948. [Chinese, with English summary.]

Inoculation experiments were carried out in 1948 with the causal organisms of red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*: *R.A.M.*, xxvii, p. 256] and pineapple disease (*Ceratostomella paradoxa*) on the sugar-cane varieties H. 1381 and P.O.J. 3016. In the red rot tests the resistant P.O.J. 2883 and the susceptible F. 109 were used as controls and fragments of the mycelium from bean cultures were inserted into holes, 1 mm. in diameter, in the middle internode of each stalk. The results of these experiments and of supplementary field trials showed that H. 1381 is resistant to *P. tucumanensis*, while the reaction of P.O.J. 3016 is intermediate between the two check varieties.

The resistant F. 108 and the susceptible P.O.J. 2883 served as controls in the inoculation tests with *C. paradoxa* which were performed similarly to the foregoing on cuttings. In addition cuttings were grown in the incubator at 30° C. in sterilized sand infested with spore suspensions of the fungus. Both H. 1381 and P.O.J. 3016 proved resistant to pineapple disease in these experiments.

WAKEFIELD (ELSIE M.). **Taxonomic problems in Hymenomycetes.**—*Trans. Brit. mycol. Soc.*, xxx, pp. 152–160, 1948.

The author presents a critical discussion of the two main groups of taxonomic problems in Hymenomycetes, viz. (1) the satisfactory delimitation of species, and (2) the best method of grouping the species and the relative importance of the characters to be used for this purpose. She concludes that before a clear and workable classification of the Polyporaceae and of other groups of the Basidiomycetes can become attainable, a much more detailed knowledge of hymenial structure and development and of the minute anatomy of the fruit bodies is necessary [cf. *R.A.M.*, xxvii, p. 249; xxviii, p. 33].

HEIM (R.). **Phylogeny and natural classification of macro-fungi.**—*Trans. Brit. mycol. Soc.*, xxx, pp. 161–178, 19 figs., 1948.

After pointing out that Fries's classification and the principles on which it is based have governed systematic mycology for nearly a century, the author expresses the view that the arrangement of groups proposed by Fries and his followers is no longer satisfactory. He then discusses the recent anatomical, embryological, and biochemical researches of a number of French mycologists which supply sound reasons for the construction of a more natural classification. The main sections of the paper deal with the Asterosporales, other connexions between Hymenomycetes and Gasteromycetes or Hypogeae, agarics with tubular hymenium, heterogeneity of Polyporeae in the Friesian system, and the influence of cytological data. He considers that new importance must be given to nutritional features, particulars of symmetry or asymmetry in the definite or indefinite growth of the hymenium and carpophore, certain biochemical characters, and relations obligatorily positive or negative in respect to the vegetation. Thus it is only from a synthesis of the data obtained from the use of various methods that it will prove possible to establish a sound natural classification of the fungi.

PEARSON (A. A.) & DENNIS (R. W. G.). **Revised list of British Agarics and Boleti.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 145–190, 1948.

This revised list of species, which the authors believe to be distinct and to have been correctly reported as British, comprises 1234 Agaricales and 47 Boletales. Appended to each genus list (arranged systematically) is an annotated list of excluded and synonymous specific epithets. The general classification based on spore colour is adhered to, but the many new genera recently introduced are indicated in the sectional headings.

JENKINS (ANNA E.) & BITANCOURT (A. A.). **Myriangiales selecti exsiccati, fasciculos 2–6. (Números 51–300.)**—*Bol. Soc. brasil. Agron.*, ix, 3, pp. 157–164, 1946.

This is a catalogue and supplementary bibliography for fascicles 2 to 6 of the authors' Myriangiales selecti exsiccati issued from Washington, D.C., in 1946 [cf. *R.A.M.*, xxv, p. 280]. These fascicles constitute a series of examples of 24 species of *Elsinoe* and *Sphaceloma*, occurring mainly on economic plants in the western hemisphere. [The same authors published under the heading Myriangiales selecti exsiccati, Fasc. 2–8, 1947, the labels for Nos. 51–400, the publication being issued by the United States Department of Agriculture, Washington, D.C.]

Sharp (A. J.). **Some fungi common to the highlands of Mexico and Guatemala and eastern United States.**—*Mycologia*, xl, 4, pp. 499–502, 1948.

This is a list of 61 fungi, collected in the highlands of Mexico and Guatemala from 1944 to 1946, all of which also occur in the eastern United States. It includes 35 Polyporaceae.

Preston (N. C.). **Observations on the genus Myrothecium. II. Myrothecium gramineum Lib. and two new species.**—*Trans. Brit. mycol. Soc.*, xxxi, 3–4, pp. 271–276, 2 pl., 5 figs., 1948.

Three species of *Myrothecium* [*R.A.M.*, xxiii, p. 191] are described. *M. gramineum* has been critically examined afresh from authentic material, a fuller diagnosis now being presented. *M. jollymannii* n.sp., isolated from dried tobacco leaves in Nyasaland in 1936, is a potential parasite, since it readily attacked living leaves and stems of *Viola cornuta* when spore suspensions were applied to detached shoots placed in a moist chamber. It differs from *M. gramineum* in having more slender, 7- to 10-septate setae round the sporodochia and in having a brown subhymenial layer. *M. striatisporum* n.sp. was originally isolated from soil in New Zealand.

Brett (Margaret A.). **The problem of Cladosporium herbarum.**—*Trans. Brit. mycol. Soc.*, xxx, pp. 141–151, 1 pl., 2 figs., 1948.

The author discusses possible relationships of *Cladosporium* with *Hormodendrum* and *Pullularia*, and reports that in her experiments transitory *Hormodendrum*-like cultures developed into *Cladosporium*-like forms from which the original *Hormodendrum* could not be recovered. In another isolate, however, the *Cladosporium* spores on germination gave rise to the *Hormodendrum* type of spore again.

Nicholas (D. J. D.). **Experiments on correcting magnesium deficiency in glasshouse Tomatoes.**—*J. hort. Sci.* (formerly *J. Pomol.*), xxiv, 1, pp. 1–18, 1948.

This paper outlines the experiments carried out from 1943 to 1946 on the alleviation of magnesium deficiency in glasshouse tomatoes at Long Ashton and summarizes the main results, already noticed in the progress reports [*R.A.M.*, xxvii, p. 49].

Wenzl (H.). **Das neue österreichische Pflanzenschutzgesetz.** [The new Austrian plant protection ordinance.]—*PflSch. Ber., Wien*, ii, 9–10, pp. 145–156, 1948.

The Austrian plant protection ordinance of 2nd June, 1948, here transcribed verbatim, is closely modelled on that of 1929, which was largely abrogated by official enactments in 1938. The protection of stored foodstuffs is now explicitly included as an integral part of plant protection. Another important provision of the new ordinance is the obligation laid on each province to establish its own plant protection centre. In the aggregate these centres, under the technical guidance of the Federal Institute for Plant Protection in Vienna, constitute the official plant protection service whereby uniformity in procedure is assured.

The new regulations comprised in section III are designed to exclude ineffective 'plant-protectives' from the agricultural and horticultural industries and at the same time to encourage the production of the effective ones. In future the commercial production, sale, and application of plant-protectives are permissible only on the basis of trials by the Federal Institute for Plant Protection, the sole authority for the whole country. Plant-protectives now on the market may not be sold or offered for sale after 23rd January, 1950, unless authorized.